

# F-89 SCORPION

in action



**Aircraft Number 104**  
**squadron/signal publications**



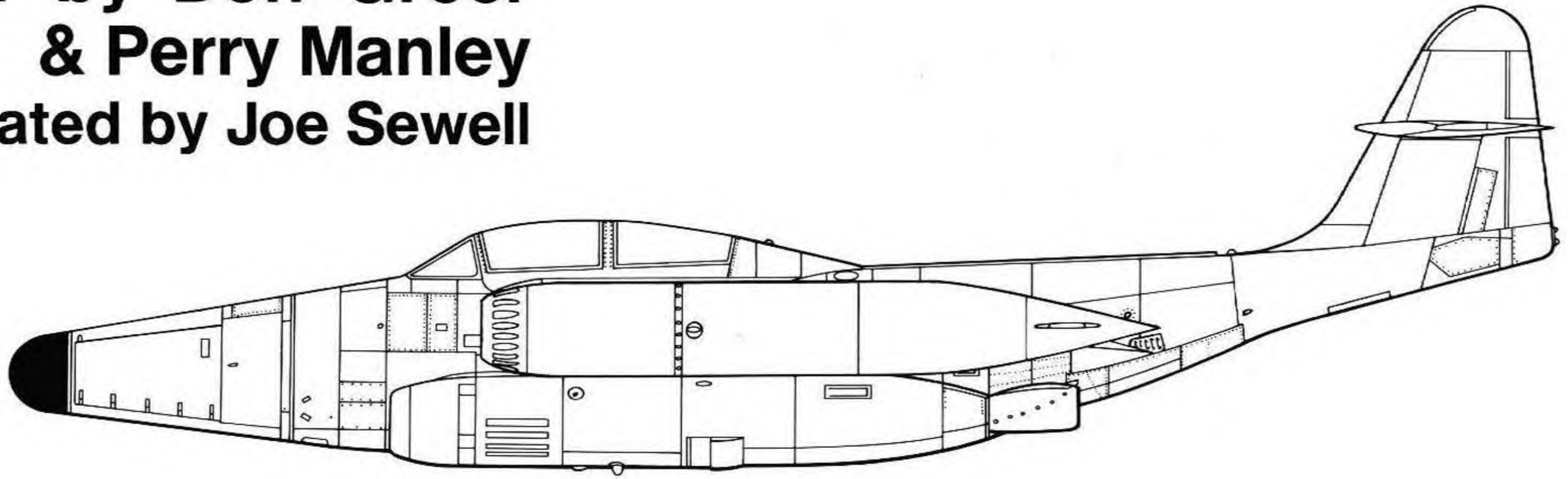
# **F-89 SCORPION**

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**Color by Don Greer  
& Perry Manley**

**Illustrated by Joe Sewell**



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An F-89D Scorpion of the 449th FIS, fires a ripple of 2.75 inch Folding Fin Aircraft Rockets (FFARs) during an exercise at the Yuma firing range. The F-89D carried a total of 104 FFARs and when fired at the same time, the rockets covered an area the size of a football field.



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## Dedication:

To the air and ground crews of the Air Defense Command, Alaskan Air Command, and Northeast Air Command, who tirelessly stood alert and flew over the frozen tundra of the far north. To these men who flew in defense of this nation with no thoughts of medals or other honors, this book is gratefully dedicated.

## Acknowledgements:

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Three F-89Ds of the 59th FIS in formation over Labrador during 1956. The aircraft in the foreground is assigned to the squadron commander and has a Yellow nose, Yellow tip tank flashes with Black stars and a Black Bat, and a Red, White, and Blue rudder with White stars. (USAF via Marty Isham)







# INTRODUCTION

The Northrop F-89 Scorpion was one of the most heavily armed fighter aircraft in history and one of Jack Northrop's last designs. The F-89 was the backbone of the North American Air Defense Command and defended the continental United States for over seventeen years, equipping thirty-nine Air Force squadrons. Scorpions were stationed from Maine to Alaska, as well as serving with units in Greenland and Iceland. The F-89 was the first aircraft designed to carry an all-rocket armament, the first operational aircraft to be armed with the Hughes Falcon air-to-air guided missile, and the first nuclear-armed interceptor. Although the F-89 never fired a shot in anger, it was a major deterrent to a Soviet attack during the Cold War of the 1950s.

The F-89 was designed by John K. (Jack) Northrop, one of the most brilliant aviation engineers of all time. His designs included the Lockheed Vega and Gamma, the Douglas SBD Dauntless, and the Northrop P-61 Black Widow, the only Allied aircraft of the Second World War specifically designed to fight at night. The most radical of Jack Northrop's designs were the XB-35/YB-49 Flying Wings. Concepts proven with these aircraft eventually led to the B-2 Stealth Bomber. All of his designs had one thing in common — they were unconventional in one way or another.

Northrop's first commercially successful aircraft was the P-61 Black Widow night-fighter, which was the Army Air Force's first true all-weather fighter aircraft. The P-61 was a typical Northrop design; big and radical. It was huge for a fighter aircraft, weighing over 22,000 pounds with a sixty-six foot wingspan. Despite its size, the aircraft had a top speed of over 400 mph and the use of revolutionary Northrop-designed retractable ailerons (now known as wing spoilers) allowed the P-61 to maneuver almost as well as any single engine fighter flying during the Second World War.

Late in the Second World War, the Army Air Technical Service Command established the requirements for the next generation night fighter. The document, titled "Military Characteristics for All-Weather Fighting Aircraft," stated that the new all-weather aircraft should be of a conventional design (meaning propeller driven) with a speed of 525 mph at 35,000 feet or 550 mph at sea level, a time to climb of 35,000 feet in 12 minutes, while its range was specified at 600 miles and the fighter had to be capable of firing aerial rockets. Six manufacturers, Bell, Consolidated-Vultee, Curtiss, Douglas, Goodyear, and Northrop submitted design proposals (Northrop actually submitted four different proposals, including one based on the radical flying wing design).

All of the design proposals had one thing in common; they were to be jet powered. Propeller driven aircraft technology simply could not meet the over 500 mph top speed set forth in the Army requirement. During November of 1945, Curtiss already had an Army contract to build the XA-43 prototype and modified this aircraft into the XP-87 Blackhawk. Curtiss had the first actual prototype and the all-weather design competition was still four months away. Despite this advantage, it was one of the four Northrop designs that won the competition. On 3 May 1946, Northrop was awarded a contract to build two all-weather fighter prototypes under the designation XP-89. The contract called for the first prototype to be delivered within fourteen months. Both Curtiss and Douglas also were awarded developmental contracts for their designs.

The XP-89 prototype emerged as a typical Northrop design — large, with a number of unique features. The aircraft was over fifty feet long, eighteen feet high, with a fifty-two foot wingspan. The wings were very thin and fragile in appearance, but the low-aspect ratio wing design served two purposes. With a low aspect ratio, the wing acted like a swept back design, having the speed of the swept wing, with none of the low-speed stability problems inherent in early swept-wings. The thin, straight wing also accommodated an internal fuel cell and could carry various wingtip stores.



**The P-61 Black Widow was the first financially successful aircraft built by Northrop and was the only Allied aircraft designed and developed specifically for the night-fighter mission during the Second World War. (AFM)**

One of the innovations in the wing was the lateral control surface. The earlier P-61 Black Widow had an unconventional aileron system, known as Northrop Retractable Ailerons. These control surfaces entered the airstream from within the upper wing to augment the small conventional ailerons. With this system, the P-61 was a very maneuverable fighter despite its size. The thin wing of the XP-89, however, would not allow the Retractable Aileron system to be used. Instead, Jack Northrop devised a combination aileron/dive brake/flap known as the Deceleron.

The ailerons were split lengthwise and could operate in one of three ways. With both halves working together, the deceleron acted as a normal aileron system. Also, in this closed configuration, the decelerons could operate in conjunction with the flaps, creating a full span flap for landing. When speed brakes were needed, the decelerons split, opening like a clamshell. All the flying surfaces on the XP-89 were hydraulically operated with an artificial "feel" built into the controls.

The XP-89 was powered by two Allison designed, 4,000 pound thrust (lbst) General Electric TG-180-01 engines (military designation J35-GE-3). The engines were mounted

**The primary competition for the XP-89 was the Curtiss XP-87 Blackhawk which had been developed from the XA-43 attack aircraft. The XP-87 was designed to carry the same armament turret as the XP-89 and was powered by four 3,000 lbst J34 jet engines. (AFM)**







**The XP-89 (46-678) was rolled out in early June of 1948. The XP-89 was huge for a fighter, unconventional and, like the P-61 it was to replace, overall Gloss Black. For its official rollout, the XP-89 did not carry its jettisonable 600 gallon wingtip fuel tanks. (Northrop)**

low under the fuselage on hydraulic swing out mounts to ease engine changes. The landing gear was also unconventional in that the nose gear was a very short, twin wheel design and the main gear was unusually tall, thin, and had large wheels with high pressure tires. This arrangement was necessary so that the landing gear would fit into wheel wells set into the thin wings. A standard joke with Air Force crews was that the wheels on the F-89 looked like they had come off a farm tractor.

The aircraft's armament was originally planned to be four M-24 20MM cannons carried in a nose mounted turret. Two turret designs were to be evaluated. One was a Martin turret which allowed the guns to be stowed inside the nose until needed. When needed, the guns were elevated and moved forward. The turret could rotate 360 degrees and the guns could elevate 105 degrees. The second turret was a Northrop design, which was similar in appearance but had a 30 degree cone of fire. Neither turret was ready when the overall Gloss Black XP-89 prototype rolled out of Northrop's Hawthorne, California, assembly plant during the Summer of 1948.

After a number of taxi and brake tests at Northrop Field, the XP-89 was disassembled and trucked to the Air Force test facility in the high desert north of Los Angeles known as Muroc Dry Lake (later Edwards Air Force Base). It was during this period that the Air Force did away with the P for Pursuit designation, replacing it with F for Fighter and on 11 June 1948 the XP-89 officially became the XF-89. It was also during this period that the aircraft acquired its name. Both the air and ground crews at Muroc, after seeing the XF-89 with its high, upswept tail and nose down attitude, remarked that it looked like a Scorpion ready to strike. The name stuck and was later officially recognized by the Air Force.

On 16 August 1948, nine months after the contract's first flight requirement, the XF-89 took to the air for the first time. Northrop Test Pilot Fred Bretcher recalls: *The XF-89 handled beautifully! The rate of roll was extremely fast and it practically beat you over the head before it stalled. Because of the heavy (wing) loading involved, the XF-89 flew a lot like a swept wing fighter. I liked that stubby, straight wing for takeoff and landings. Even with tip tanks on, the ship handled beautifully. The ship was big and tough. That's what the Air Force ordered - and that's what they got!*

While the test crews were enthusiastic, the Air Force was skeptical and ordered a fly-off competition between the XF-89, the Curtiss XF-87, and the Navy's Douglas XF3D-1 Skynight. The results were interesting. The evaluation team was made up of experienced interceptor (night fighter) pilots, radar operators (ROs), and crew chiefs. Cockpit arrangement (seating) was won by the XF-87, with the XF3D Skynight placing second. Ease of maintenance went to the Skynight, with the XF-87 in second place. Although finishing last in most categories, the evaluation team voted to procure the XF-89 over the other two aircraft. The reason for this recommendation was simply stated by one of the team: *The XF-89 was a better fighter and had superior developmental potential.*

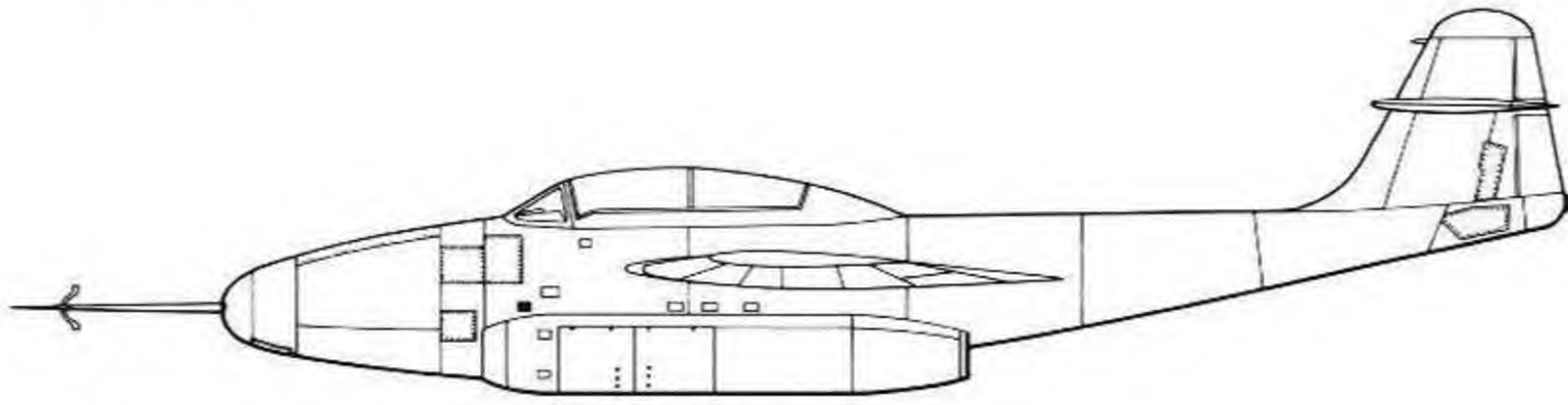
Curtiss lost their contract to build 88 F/RF-87 Blackhawks and subsequently quit aircraft manufacturing. A sidenote to the competition was the fact that the evaluation board also awarded a contract to Lockheed (which was not a competitor) to build a modified version of the TF-80C as an interim interceptor until the XF-89 became available (this interim interceptor was the F-94 Starfire which later saw combat in Korea).

**The XF-89 made its first flight on 16 August 1948 under the control of Northrop Test Pilot Fred Bretcher. The flight took place at Muroc Dry Lake (now Edwards Air Force Base). Design problems with the horizontal stabilizer led to the destruction of the XF-89 on 22 February 1950. (AFM)**

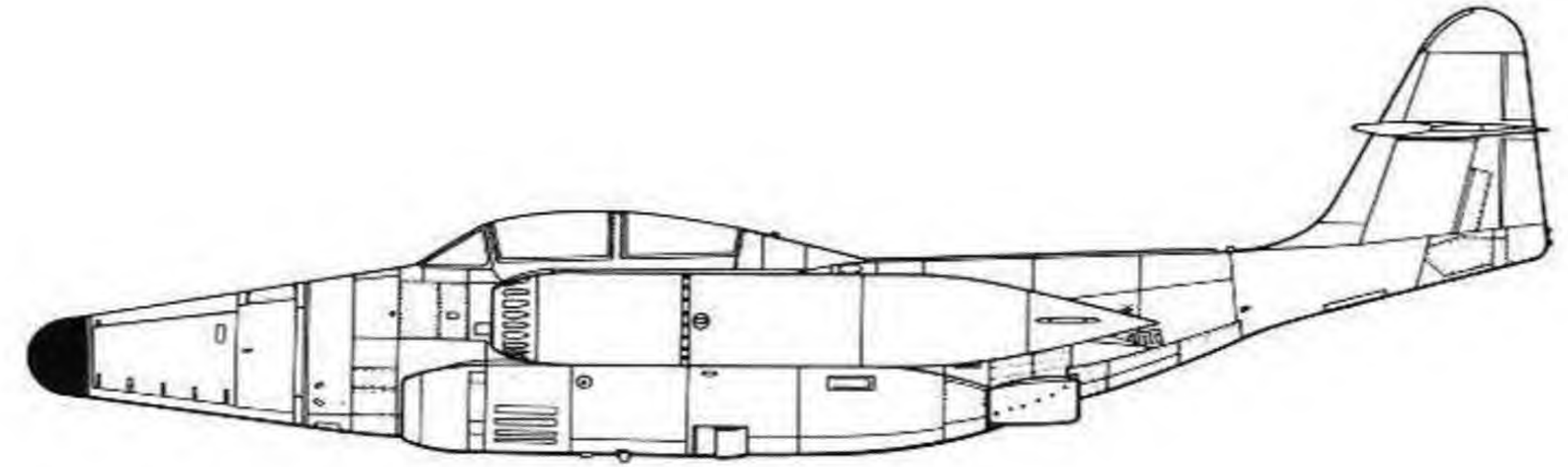




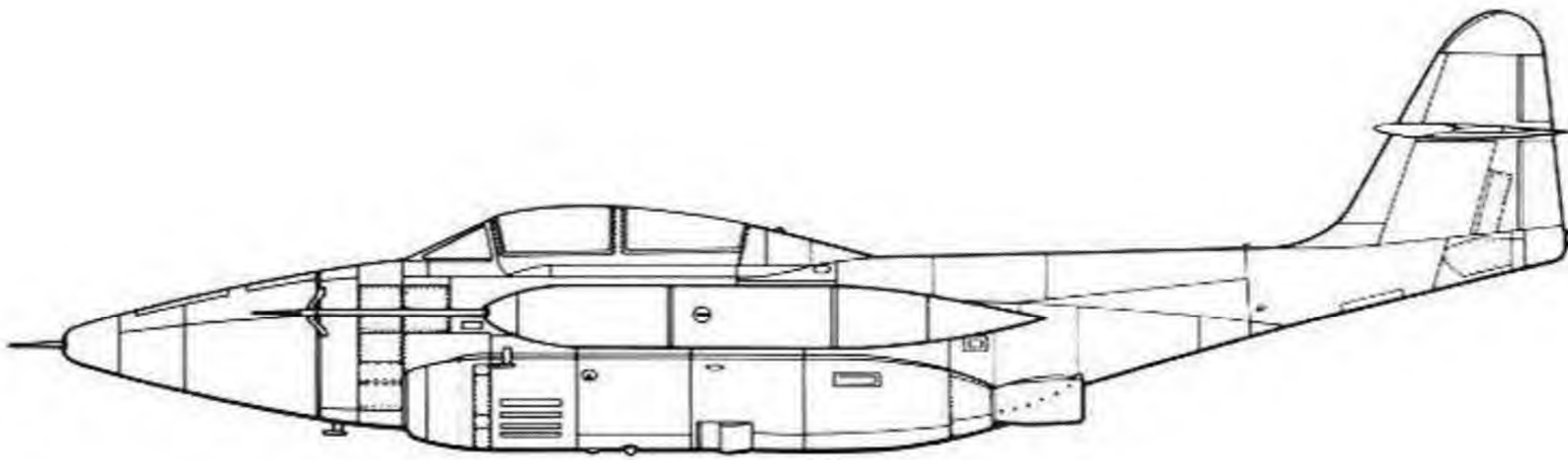
## Development



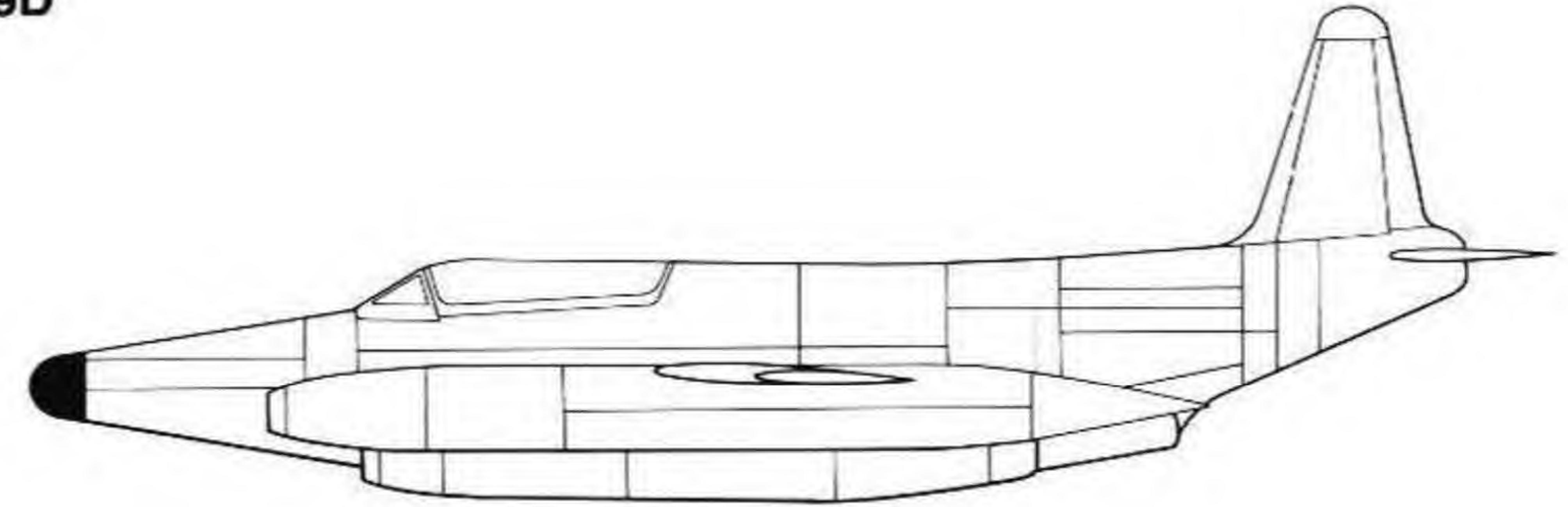
**XP-89**



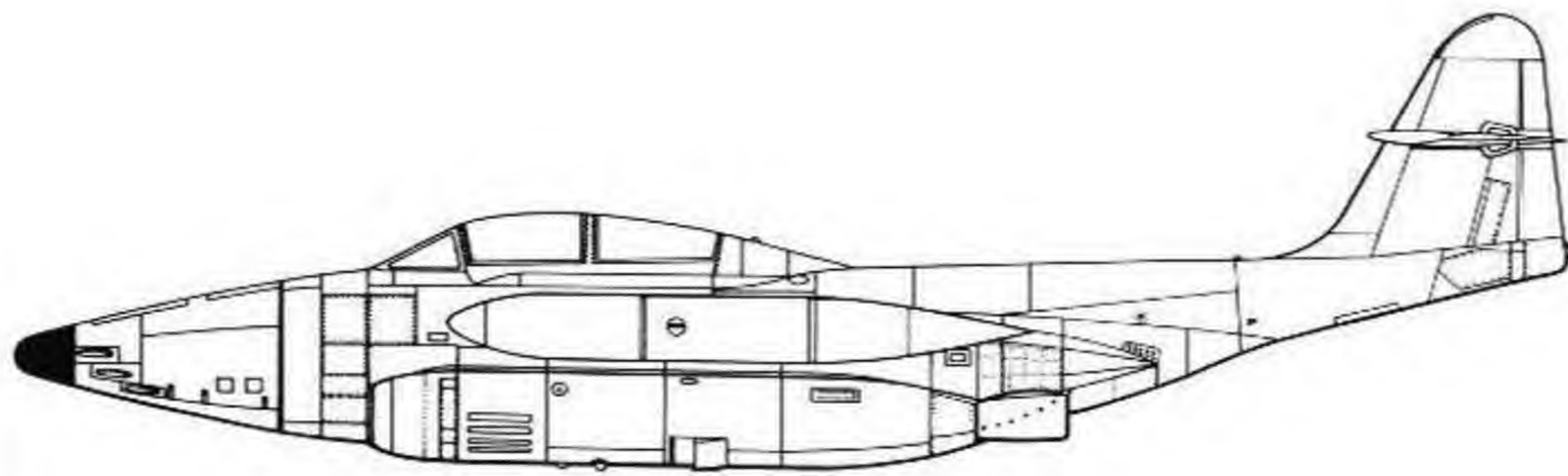
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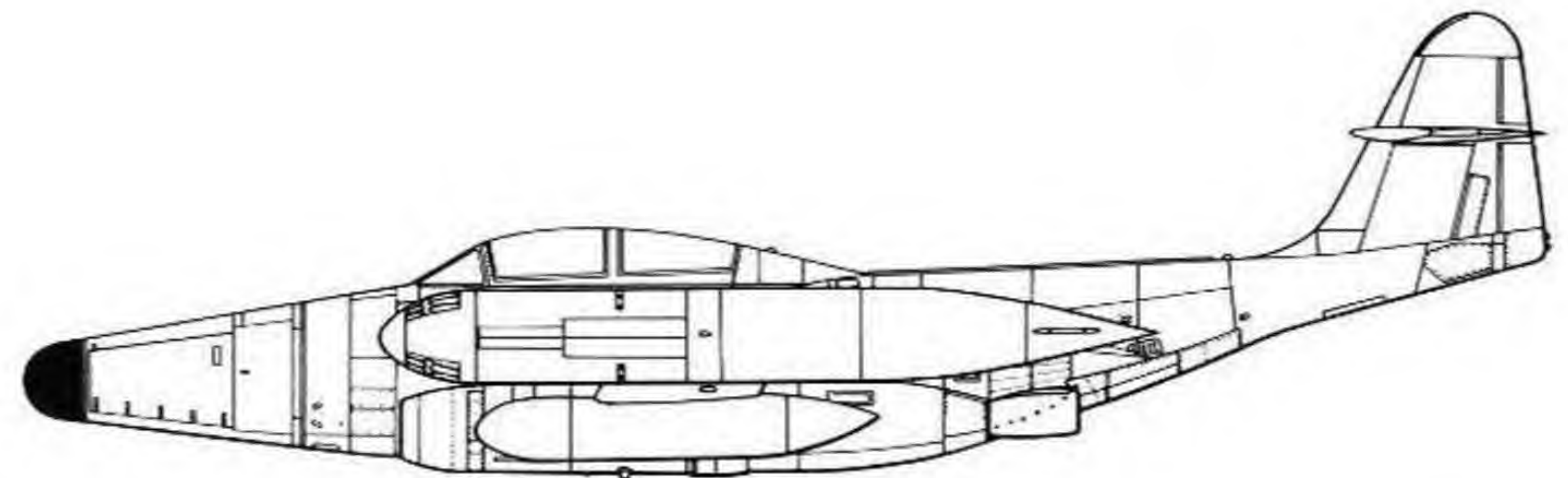
**YF-89**



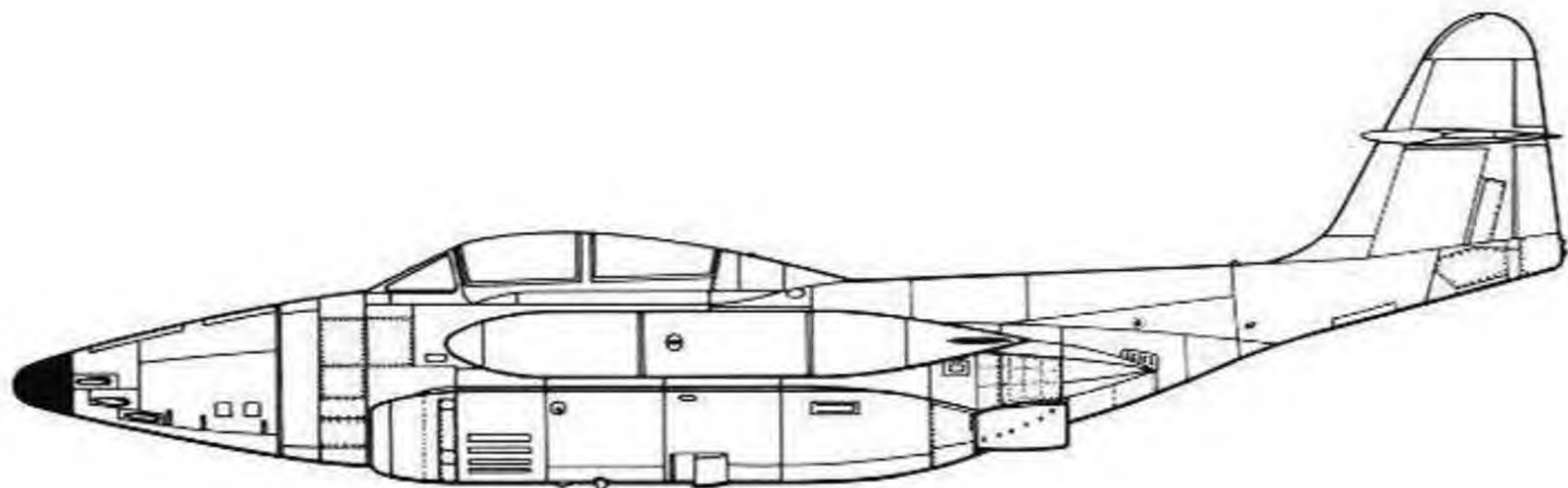
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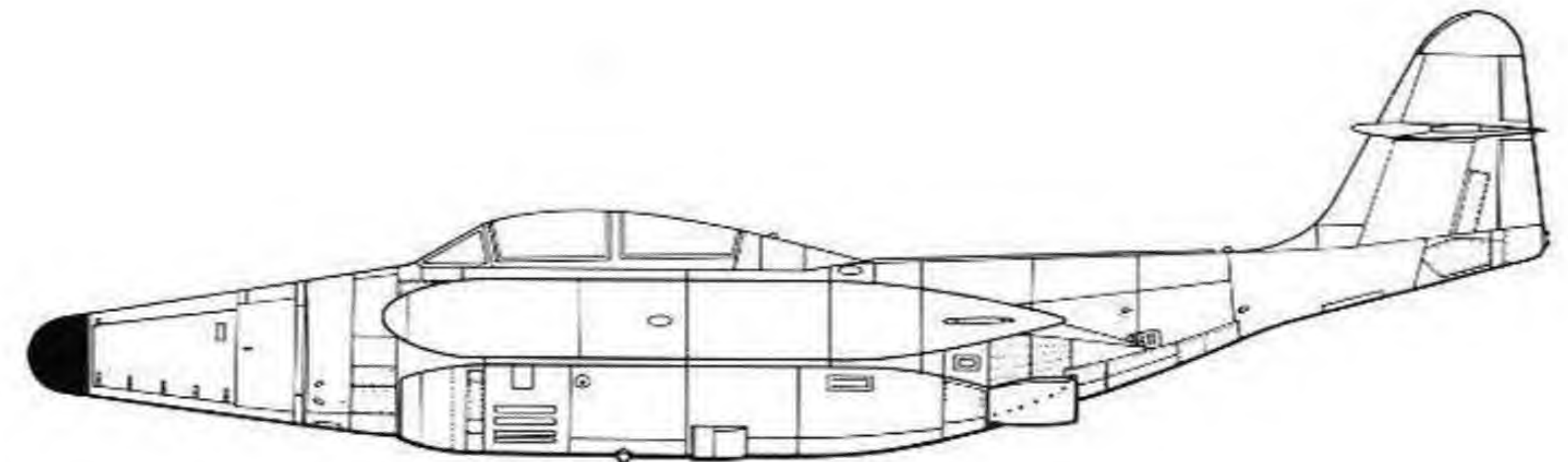
**F-89A/B**



**F-89H**



**F-89C**



**F-89J**



# YF-89

During June of 1949, the Air Force awarded Northrop a 48 million dollar production contract for the F-89. The contract called for Northrop to modify the second XF-89, build forty-eight production aircraft under the designation F-89A and supply the spare parts, special tools and ground handling equipment necessary to maintain the F-89. The most striking modification to the second XF-89 was the deletion of the nose mounted gun turret. The nose was redesigned to carry six fixed forward firing 20MM Mk 24 cannons. The redesigned aircraft, now designated the YF-89, made its first flight on 15 November 1949.

Problems with the F-89 began to surface when the XF-89 prototype crashed on 22 February 1950 during Phase II flight tests. The cause of the crash was found to be the failure of the right horizontal stabilizer due to stabilizer/elevator flutter. Air Force investigators found that many of the problems that the Air Force had earlier identified (both in the mock-up and wind tunnel models) with the F-89, including tail flutter, had not been corrected in the XF-89. As a result of these findings, the YF-89 was grounded for further changes and F-89A production was halted.

The changes the Air Force demanded in the YF-89 were extensive. The nose was completely redesigned, being more tapered and some three feet longer. Armament now consisted of six cannons and an AN/ARC-33 radar coupled to a Hughes E-1 Fire Control System (FCS). The 4,000 lbst J35-GE-3 engines were replaced with 5,200 lbst J35-A-21 turbojets. These engines were equipped with afterburners that increased their power to 6,800 lbst. The engine air intakes were redesigned to include external boundary layer bleed ramps and auxiliary pop-in doors were added to the nacelle to supply additional air during ground engine operations.

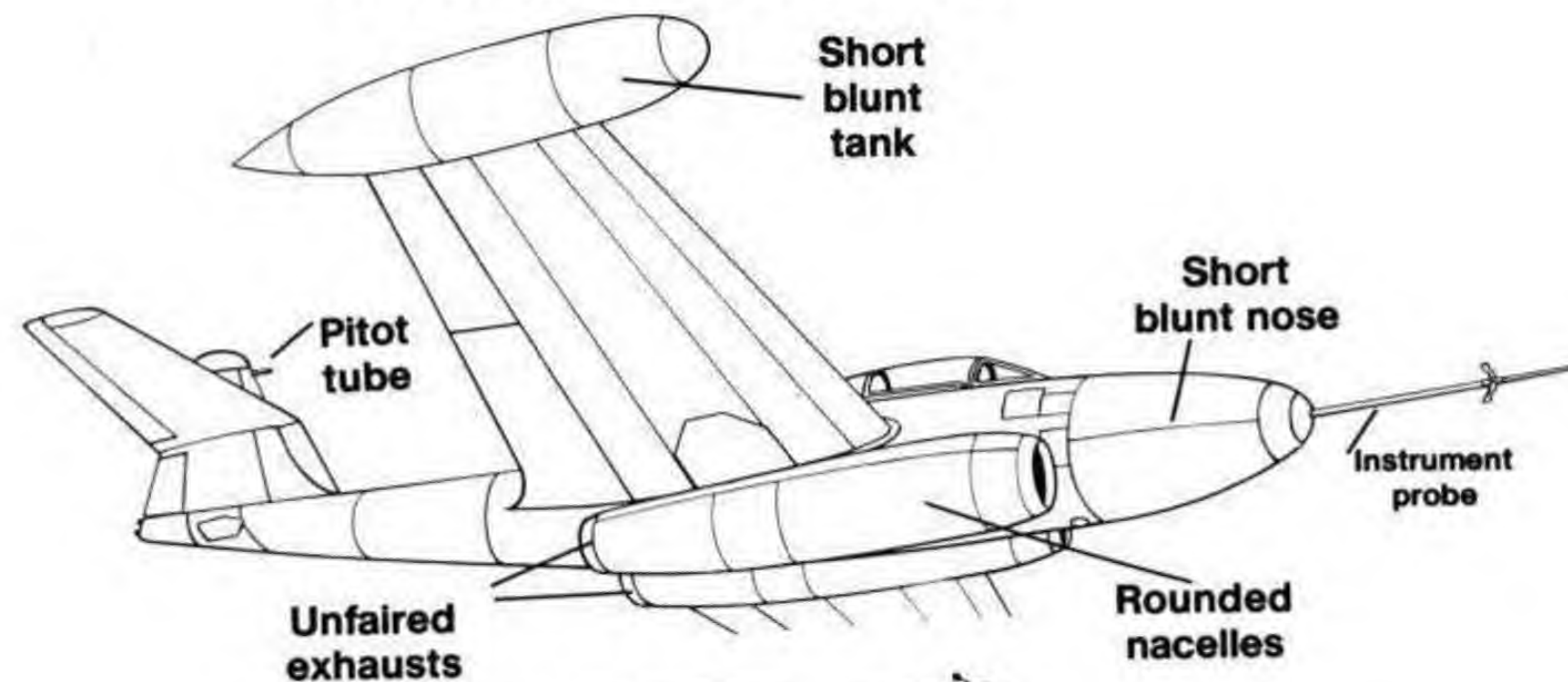
The engine exhaust area was also extensively modified. The engineers believed that the tail flutter problem was caused by pulsations from the jet exhaust, which traveled up the rear fuselage/vertical tail. It was these pulsation that caused the horizontal tail to flutter. To cure the problem, deflector plates were added to the fuselage behind the engine exhaust. Later a more complex "jet wake fairing" was added under the rear fuselage to deflect the exhaust away from the tail area.

The last modification performed to the YF-89 was replacement of the jettisonable 300 gallon wingtip fuel tanks with permanently mounted, more streamlined 300 gallon tanks. On 27 June 1950, the modified prototype, redesignated the YF-89A, made its first flight and the F-89 flight test program was resumed.

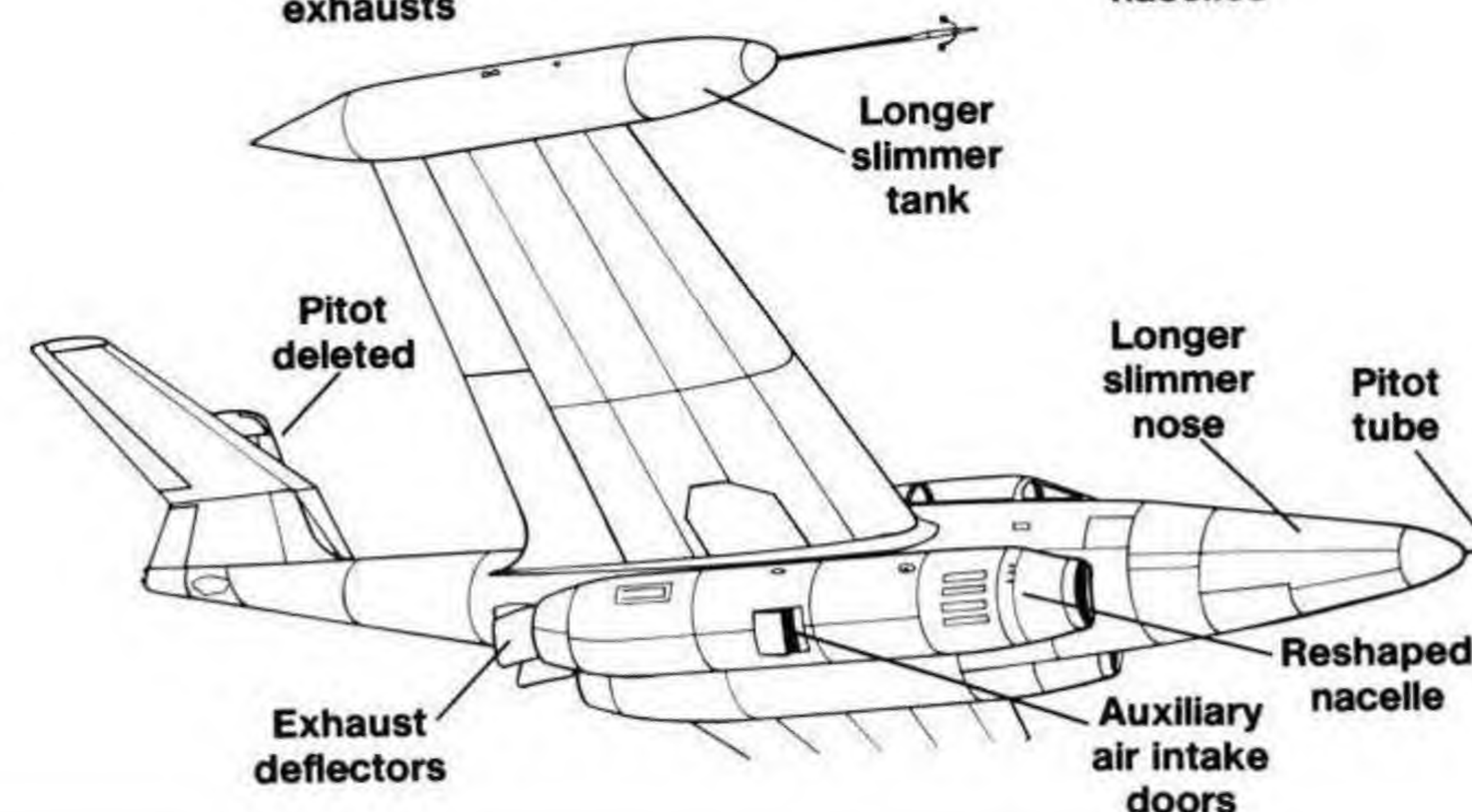
The investigation of the XF-89 crash uncovered a number of needed changes and led to a redesign of the nose, engine intakes and exhaust area on the YF-89A. The armament was changed to six fixed forward firing 20MM cannons. The long probe mounted on the starboard wing tip tank is a flight test instrument probe. (Northrop)

## Fuselage Development

XP-89



YF-89A





# F-89A/B Scorpion

Before the problems with the XF-89 and YF-89 surfaced, Northrop had begun production of the F-89A. President Harry Truman had authorized an initial purchase of forty-eight F-89As during January of 1949 and an additional twenty-seven aircraft were added to the contract during September of that same year. The 22 February 1950 crash of the XF-89 and the problems that the investigation uncovered, however, quickly brought the entire F-89 test program and the assembly line to a halt.

The Air Force wanted the F-89 and they wanted it — NOW! The Soviets had exploded an Atomic bomb during 1948 and the Air Force knew that Soviet long range bombers could deliver Atomic weapons against U.S. targets by flying the Polar routes. Despite this sense of urgency, the Air Force would not accept the F-89 until its problems were completely fixed. Until the modifications that were made to the YF-89A could be thoroughly tested, the Air Force halted F-89A production, accepting three F-89As that were near completion. These three aircraft, in addition to the YF-89A, would make up the test force used to evaluate the future of the F-89 program. The F-89A differed from the YF-89A in that they were fully armed, carrying six 20MM cannons.

The first production F-89A was accepted by the Air Force on 28 September 1950, followed by the second and third aircraft within a few weeks. All three F-89As were virtually identical to the YF-89A and included the "quick fix" modification that was intended to cure the stabilizer/elevator flutter. The "quick fix" modification was a series of external mass balance horns, known as ice tongs, attached to the hinge area of the horizontal stabilizer/elevator. Additionally, the underfuselage exhaust deflector fairing was changed and a number of different fairing designs were tried before a final design, now known as a jet wake fairing was accepted.

With these changes, the problem of tail flutter was finally resolved and production of the F-89A was resumed during January of 1951. In any event, production of the F-89A was limited to a total of eighteen aircraft. There were enough changes made to the aircraft that the Air Force decided to redesignate the remainder of the production run as either F-89Bs or F-89Cs. Of the eighteen F-89As accepted by the Air Force, nine were retained as test aircraft. The remainder were used as maintenance trainers. Eventually, a small number were finally delivered to operational units during the Summer of 1952, nearly a year after the F-89B entered service.

## F-89B Scorpion

Externally the F-89B was identical to the late production F-89A equipped with the external mass balance horns. Internally, the F-89B differed from the YF-89A/F-89A with the installation of a Lear F-5 autopilot, an instrument landing system (ILS), and a Sperry Zero Reader (which combined the functions of artificial horizon, directional gyro, magnetic compass, and altimeter). As a result of a rash of engine failures on early F-89Bs and F-89As, the aircraft were re-engined with 5,100 lbst (6,800 lbst in afterburner) J35-A-21A turbojets. These engines had an engine oil scavenging system and redesigned afterburner eyelids which gave a smoother afterburner control.

The first production F-89B was accepted during February of 1951 and entered service



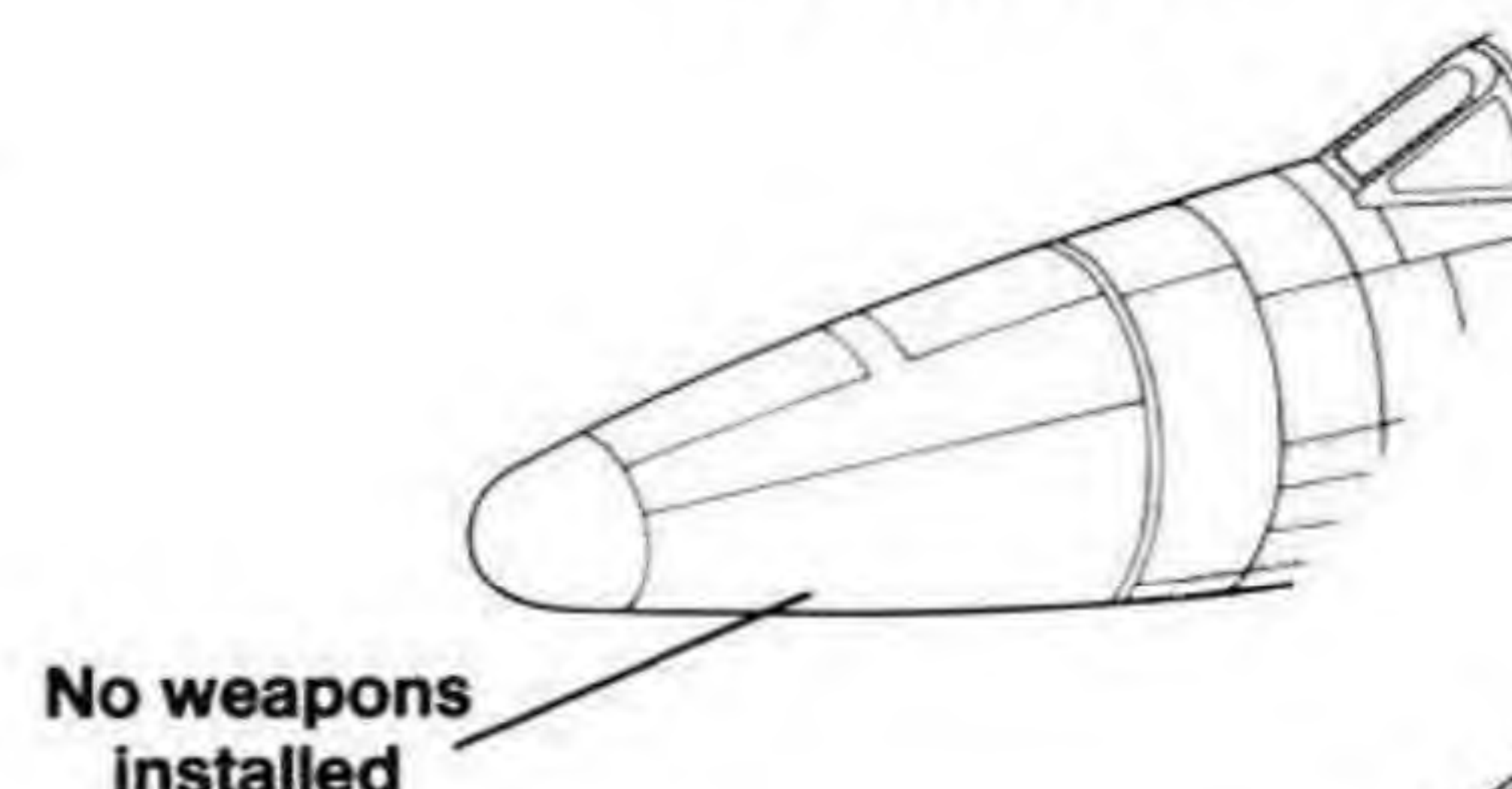
One of the first eighteen F-89As produced, during a test flight over the desert flight test facility at Edwards AFB (Muroc Dry Lake). The wingtip fuel tanks on the F-89A were longer, slimmer and permanently attached to the wing. This F-89 carries an instrument test probe mounted on the nose. (John Fietze)

with the 84th Fighter Interceptor Squadron, 78th Fighter Interceptor Group based at Hamilton AFB, California, during June of 1951. The 78th FIG was the only Air Force Air Defense Command unit completely equipped with the F-89B, although both squadrons within the group remained under strength until the arrival of the F-89C.

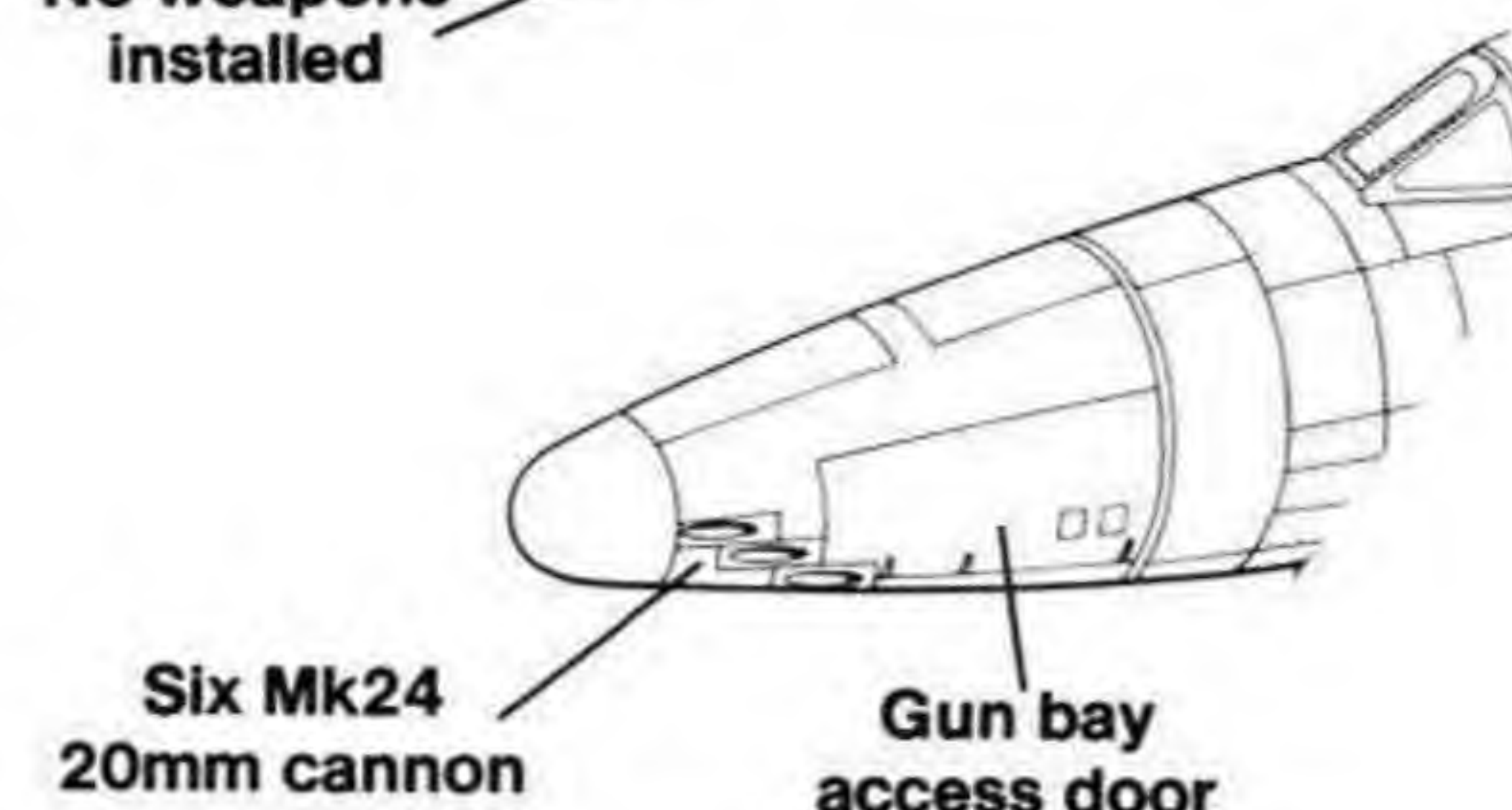
A total of thirty-seven F-89Bs were completed before production ceased during September of 1951. By 1954 all F-89As and F-89Bs had been transferred from Air Defense Command to the Air National Guard. The first Guard unit to re-equip with the F-89B was the 176th Fighter Interceptor Squadron, 128th Fighter Interceptor Wing, Wisconsin Air National Guard based at Truax AFB.

### Armament

YF-89A



F-89A/B







This colorful early F-89B of the 190th Fighter Interceptor Squadron, Idaho Air National Guard was based at Gowen Field, Boise, Idaho. The bands on the nose, tail and tip tanks were Black with either White or Yellow stars depending on the flight the aircraft was assigned to. (David Menard)

This early production F-89B was used as a control aircraft for the Northrop SM-61 Snark intercontinental missile under the designation DF-89B. The aircraft has been modified with a pair of underwing fuel tanks and a modified nose. (Northrop)

An early F-89B is towed out from the outdoor assembly area at Northrop's Ontario, California, facility. The F-89B had a number of internal modifications; however, externally it was identical to the F-89A. The aircraft is painted in a coat of Green Chromate primer to protect it against the weather. (Northrop)







To solve the tail flutter problem, external mass balance horns, known as ice tongs, were fitted to all F-89A/Bs. It was later learned that the flutter was caused by jet engine exhaust pulses traveling up the tail and setting up a vibration. This led to a major program to redesign the jet exhaust area. (AFM)

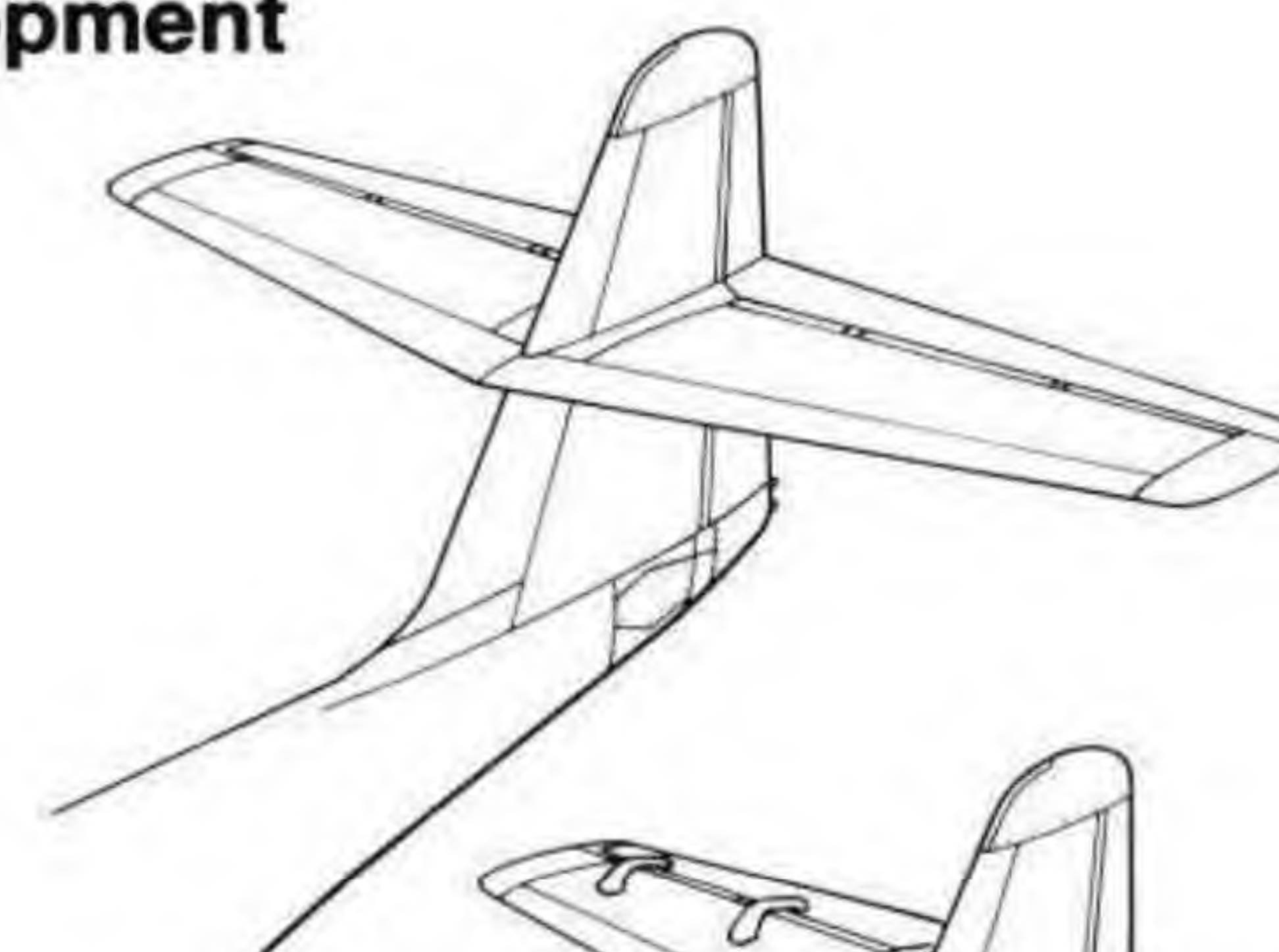
An F-89A fires a salvo of 5 inch High Velocity Aircraft Rockets (HVARs) at a ground target. The F-89A/B/C could be fitted with underwing rocket launchers for a total of eight HVARs along with two pylons for carrying bombs. (Northrop)



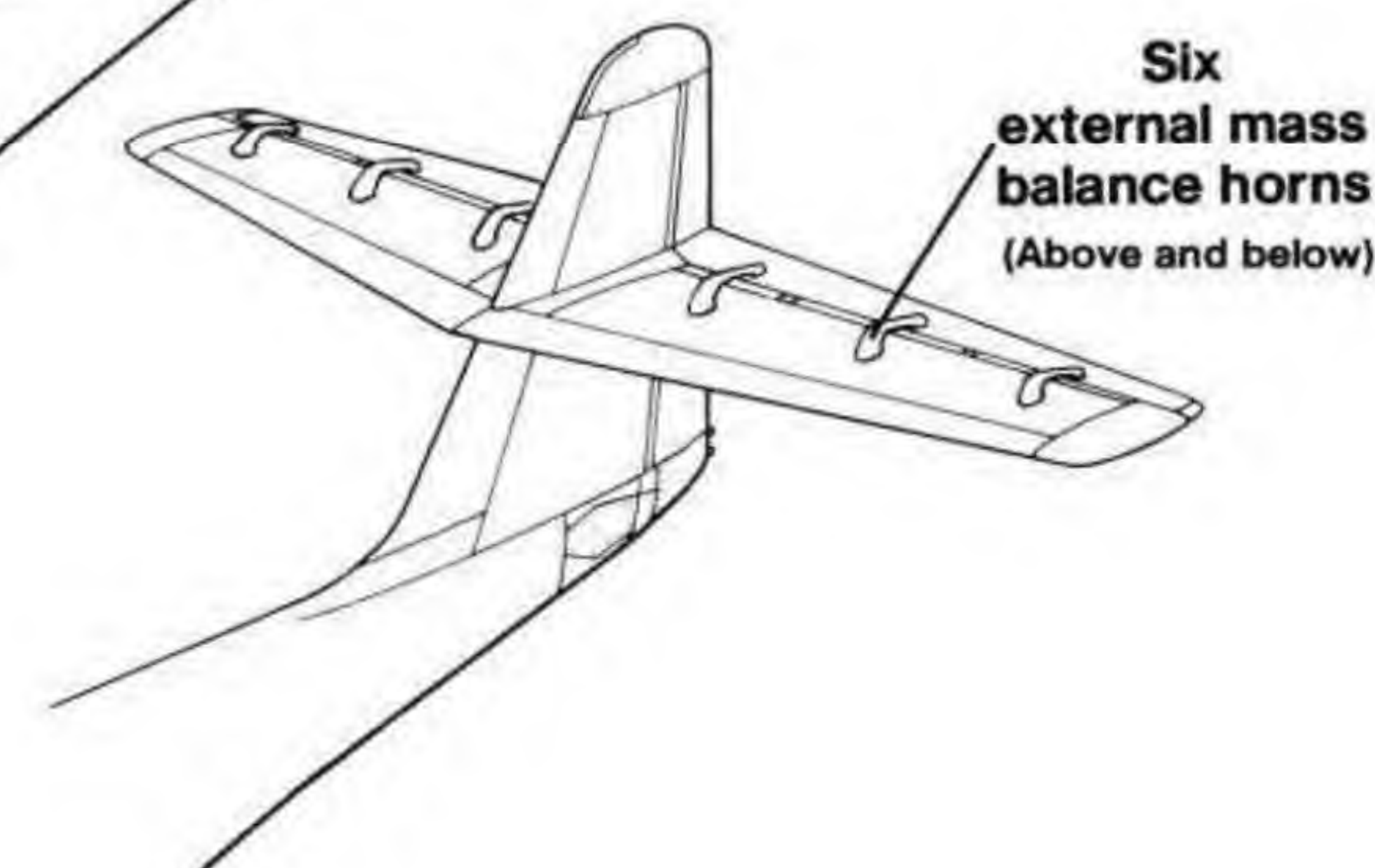
This F-89B was deliberately lowered onto its nose during an overhaul so maintenance men could gain access to some of its internal equipment. The armament bay, radar, air conditioning equipment bay and engine access panels are all open for servicing and the canopy has been removed. (Northrop)

## Tail Development

YF-89A



F-89A (Late)  
F-89B





# F-89C Scorpion

The F-89C incorporated all the changes demanded by the Air Force to make the F-89A a fully operational and safe aircraft. Externally the F-89C differed little from the F-89B — with one exception. After production of the first forty F-89Cs, the external mass balance horns on the horizontal stabilizer/elevator were deleted. These external balances were replaced by a strengthened horizontal stabilizer/elevator with internal mass balances (the internally balanced stabilizers were retrofitted to all previous F-89s).

Internally, several systems upgrades were made to the F-89C to improve its performance. A fuel purging system was added to the fuel system which decreased the possibility of fuel vapor explosions, the wingtip fuel tanks had dump valves installed which allowed them to be emptied while in flight, the cockpit air conditioning and pressurization system was upgraded, and a Lear vertical gyro was added to provide artificial horizon information to the autopilot.

The Scorpion continued to be plagued by technical problems, including numerous engine failures. This problem was solved, like the earlier F-89B, by retrofitting early production F-89Cs (Blocks -1, -5, -10, -15, and -20) with J35-A-21A engines. Beginning with Block -25 aircraft, the engine was changed to the 5,400 lbst (7,400 lbst in afterburner) J35-A-33 engine. Finally, with Block -35 aircraft the engine was once again changed to the 5,600 lbst J35-A-33A. The J35-A-33A engine not only had more power, it also featured a redesigned inlet, deicing equipment, inlet guide vanes, and redesigned forward engine mounts.

One recurring problem was that the intakes, being low on the fuselage and close to the ground, acted like a huge vacuum cleaner, ingesting anything that the aircraft rolled over. To overcome this problem, a retractable inlet screen was added to the -33A engines and became standard on all subsequent F-89s. Manually removable intake screens, however, were still fitted on the intakes for ground operations.

As was common with many early jet aircraft, the F-89 had a number of serious developmental problems. Early jets were encountering aerodynamic forces that were not fully understood. During early 1952, several F-89Cs crashed due to structural failure of the wing for no apparent reason. Six aircraft were completely destroyed during the Spring and Summer of 1952, including one in front of thousands of spectators at the International Aviation Exposition in Detroit. Once again, the entire F-89 fleet was grounded and production was suspended until a cause for these disastrous crashes could be found.

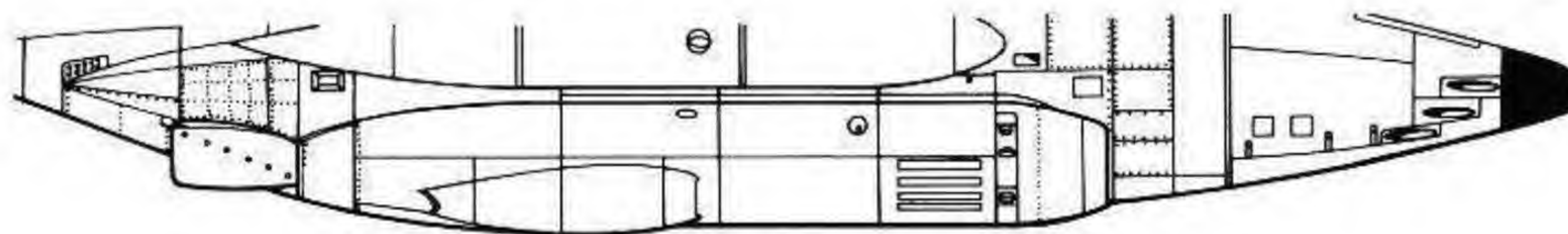
The cause of the crashes was found to be two-fold: (1) the wing attachment points failed under certain high G maneuvers and (2) a previously unknown phenomenon called aero-elasticity was causing the wing to twist at the wingtip. This twisting causing an undue strain on the wing attachment fittings which failed. To cure the problem, the wing was strengthened, with the attachment points being changed to forged steel. Small fins were added to the outboard rear of each wingtip tank, which eliminated the wingtip twisting tendency. A total of 194 F-89As, Bs, and Cs were ferried back to Northrop by company crews, where they were fitted with the modified wings. Before the fleet was cleared for flight once more a total of fourteen months had passed.

Although the F-89C had made its first flight on 18 September 1951, the engine and wing failures kept the F-89 fleet from reaching its intended force levels until 1954. During January of 1952, the 74th Fighter Interceptor Squadron based at Presque Isle AFB, Maine, had been declared operational with the F-89C. Other units soon followed, but were all grounded because of the wing failures. The Air force was anxious to get the F-89s



The F-89C differed from the F-89A/B in that it had an internally balanced stabilizer/elevator assembly, a redesigned jet wake fairing and a fuel system purge generator on the starboard engine nacelle. These modifications ended the F-89's tail flutter problem and made the Scorpion one of the safest aircraft in the Air Force. (Northrop)

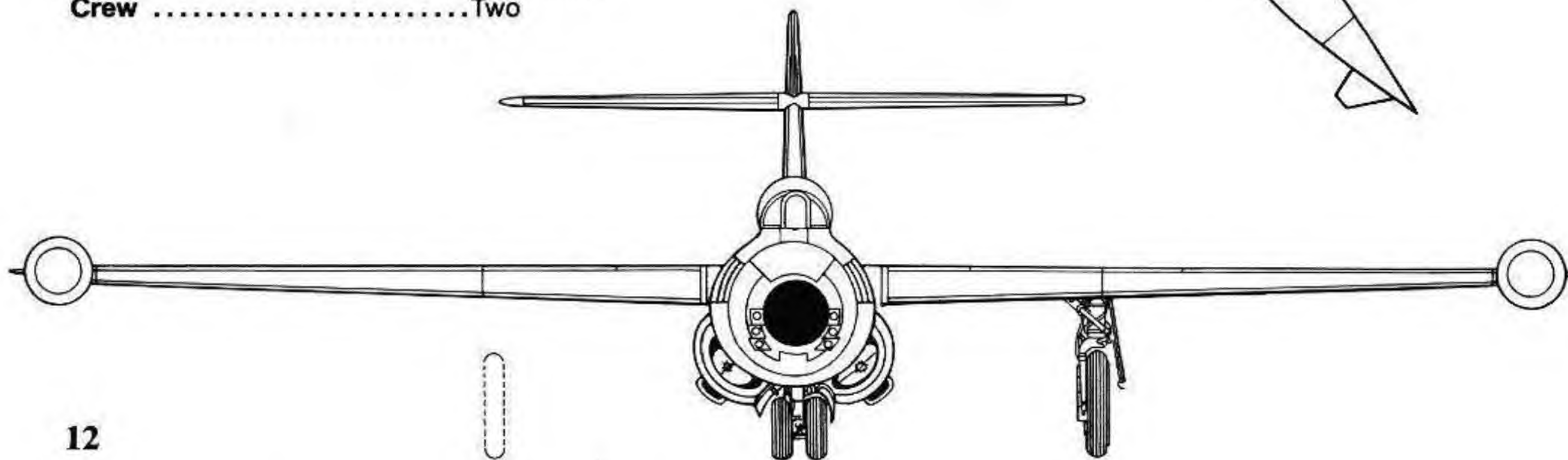
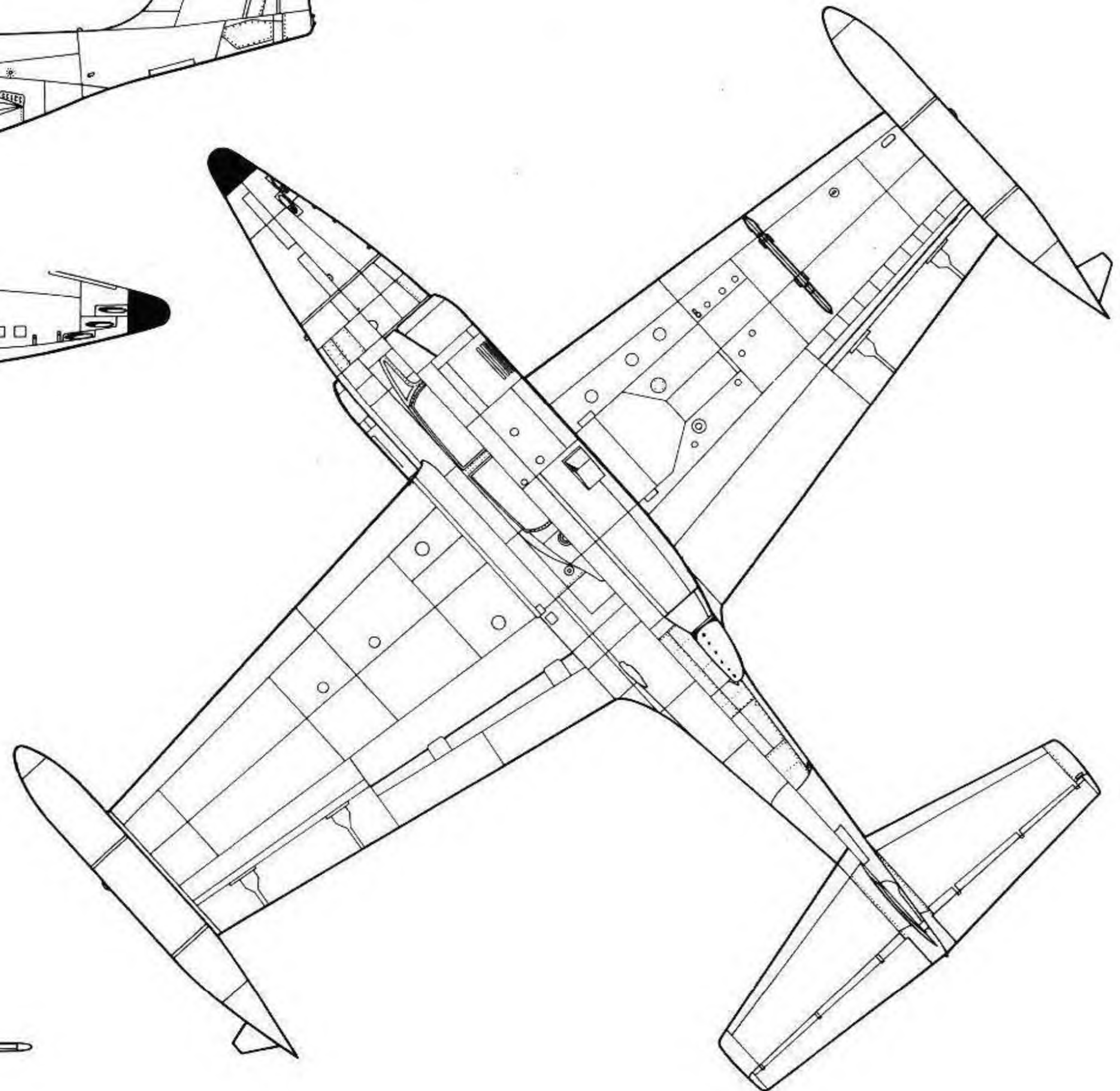




## Specifications

## Northrop F-89C Scorpion

|                              |             |
|------------------------------|-------------|
| <b>Performance</b>           |             |
| <b>Maximum Speed</b> .....   | 570 mph     |
| <b>Service ceiling</b> ..... | 40,000 feet |
| <b>Range</b> .....           | 1,300 miles |
| <b>Crew</b> .....            | Two         |







A lineup of new production F-89Cs on the ramp at Northrop's Ontario, California, final assembly area. The aircraft are being prepared for final test flights before delivery to an Air Force unit. Within a few months, all F-89s would be returned to Ontario for wing modifications. (Northrop)



An F-89C of the 57th Fighter Interceptor Squadron (based at Presque Isle AFB) on the ramp at Ethan Allen AFB for an Open House during 1953. The bands on the nose, tail and tip tanks are Black with White stars and outline. The main landing gear doors are Black with a Yellow crescent Moon and stars. There is a Black flight leader's stripe on the rear fuselage. (via Marty Isham)

back into service as soon as they could be modified and as aircraft came off the Northrop modification line they were flown directly to an operational unit. With the modified wings and uprated engines, the F-89Cs had become one of the safest aircraft in the Air Force. The 74th FIS, following its transfer to Thule, Greenland, completed a full year without an accident of any type.

With the numerous problems in the F-89 program, supplies of spare parts and maintenance equipment were often in short supply at the squadron level. John Finiello, a 433rd FIS Crew Chief recalled: *"The Air Force supply system at the time (1953) did not have the supplies necessary to support the aircraft. Often we had to make do with what we had or order supplies from civilian sources. One example of this was the lack of engine change dollies. At Truax, we had a certain area allocated for engine changes. When an engine change was required, we towed the aircraft onto marks painted on the floor, drop its engines onto mattresses laid on the hanger floor, then tow the aircraft to another marked spot where new engines were also waiting on mattresses. We would then use the aircraft's internal engine hoist system to pick up the new engines and re-install them."*

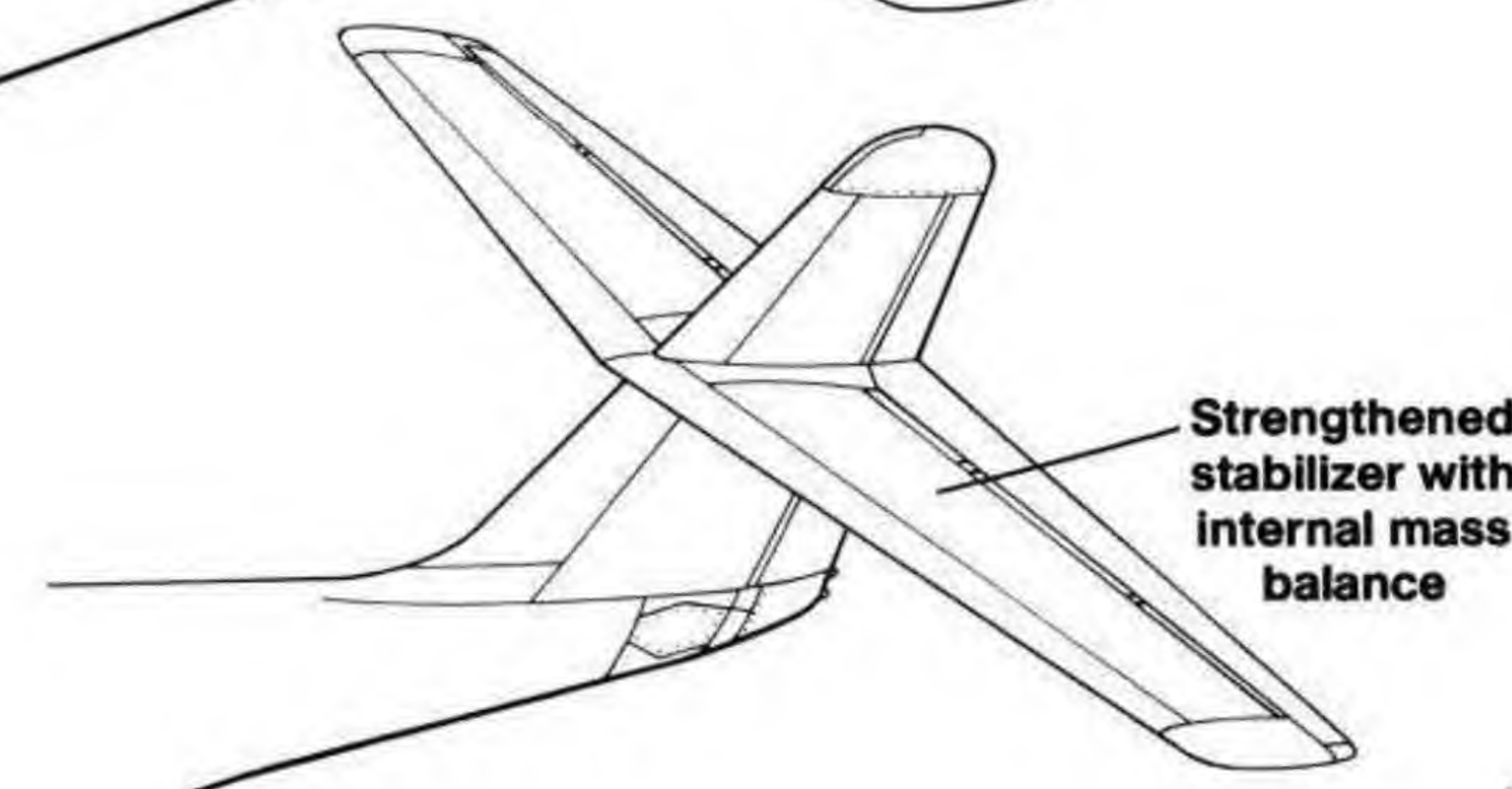
The F-89C was phased out of active Air Force service during 1954 when newer F-89 models became available in quantity. The aircraft were transferred to the National Guard, becoming a vital part of the Air National Guard interceptor force, equipping some seven squadrons in the northern tier units. National Guard squadrons flew the F-89Cs well into the 1960s. Northrop built a total of 163 F-89Cs at an average fly-away cost of \$797,202.00 each.

## Tail Development

F-89A/B



F-89C







A shark mouthed F-89C-15 of the 433rd Fighter Interceptor Squadron at Truax AFB, Wisconsin. The first forty F-89Cs off the Northrop production line had the external mass balances on the horizontal tail. These aircraft (like this F-89C) were retrofitted with the internally balanced tail as soon as they were available. (William J. Balogh)

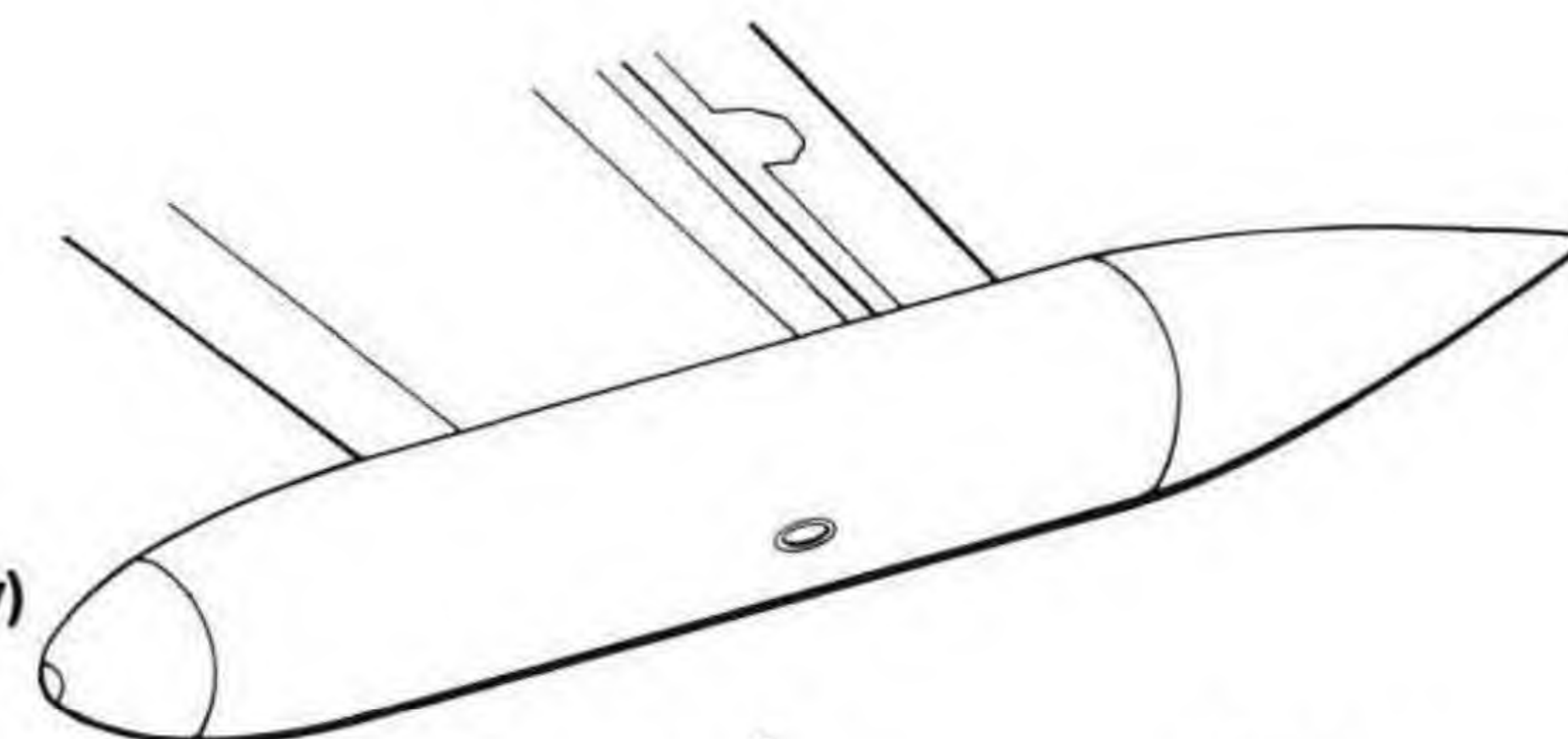
A flight of F-89Cs of the 57th FIS over Iceland during 1954. The 57th FIS moved from Presque Isle to Keflavik, Iceland, on 12 November 1954. The leading edges of the fin and horizontal stabilizers were left natural metal since the Red paint of the Arctic markings peeled easily at high speed. (Erroll Williams)



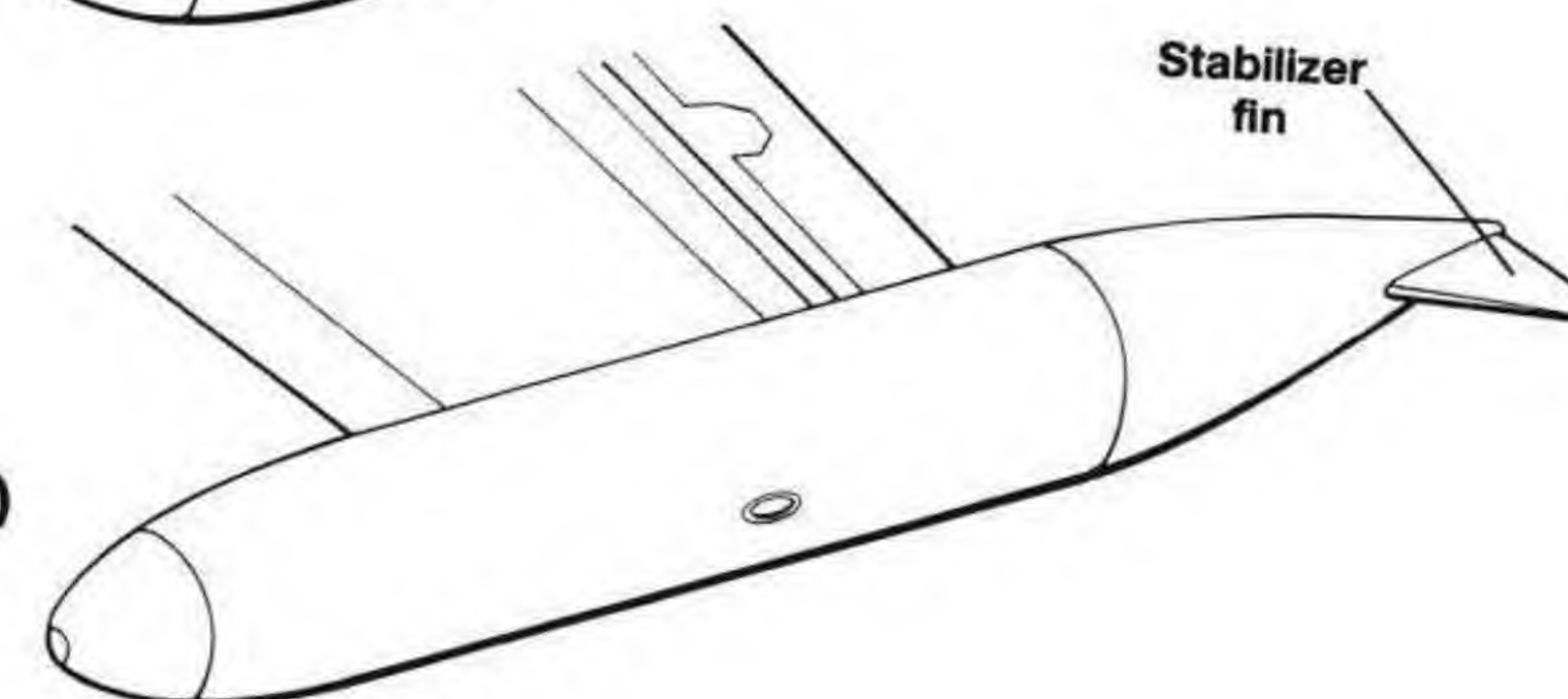
Three F-89Cs of the 74th FIS on the ramp at Thule, Greenland, during 1954. The 74th moved to Thule on 20 August 1954 from Presque Isle, Maine. The Arctic markings (Insignia Red FS12197) were required on all Air Force aircraft flown over snow covered areas as an aid in locating aircraft that might be forced down. (James Ford)

### Tip Tanks

F-89A/B  
F-89C (Early)



F-89C (Late)







F-89Cs crowd the 74th Fighter Interceptor Squadron hangar at Thule, Greenland. The 74th changed their squadron markings to a swept back Red band on the nose when they moved to Thule. The 74th FIS emblem, which is also the 23rd Fighter Interceptor Wing badge, is carried on the nose just below the anti-glare panel. (via Don Garrett)

An F-89C of the 433rd FIS on the ramp at Truax. The large 433rd FIS badge on the intake is followed by the crew names. The large size of the F-89 is apparent when compared to the 1952 Mercury parked next to the Scorpion. (John Finiello)



Ground crews attach external intake screens to an F-89C of the 74th FIS at Thule. Although the F-89C had electrically operated internal engine screens, these external screens were used to keep foreign objects out of the intakes of alert aircraft (which were exposed to the elements for longer periods). (USAF)





This F-89C of the 57th FIS at Presque Isle, Maine, is a flight leader's aircraft as identified by the band on the rear fuselage. The markings are identical to those of the 74th FIS with the exception of the Black Knight badge on the tail. The small fins on the wing tip tanks countered aero-elasticity, which twisted the wingtip and could cause a wing failure. (Bob Dorr via Marty Isham).

An F-89C of The 57th FIS closes in on the wingtip of another squadron aircraft during the 1953 Gunnery Meet at Yuma, AZ. The nose, wing and tail bands are Black with White stars and a thin White outline. (Erroll Williams)



An F-89C of the 74th FIS is prepared for an open house at Presque Isle AFB, Maine, during 1953. These are the final markings worn by the 74th prior to deployment to Thule, Greenland and adoption of Arctic Red markings. (David Menard via Marty Isham)

One of the armament experiments conducted with the F-89 was the use of two T-110 rocket guns mounted in the nose. The T-110 used a 2.75 inch spin stabilized rocket projectile which was fired through a rifled barrel. Once clear of the aircraft the rocket ignited, giving the projectile a range of 2,000 yards. (Northrop)







An F-89C of the Michigan Air National Guard reveals typical Air Guard national and service markings under the wings. These were later removed from Michigan ANG aircraft when full squadron markings were applied to the aircraft. (Selfridge Military Air Museum)



F-89Cs of the 107th FIS, Michigan ANG are lined up on the ramp at Selfridge ANG Base during August of 1959. The aircraft in the foreground, F-89C (51-5782), is the squadron commander's aircraft. (William Balogh via Selfridge Military Air Museum)

The stripes on this F-89C of the 107th FIS based at Selfridge, Michigan, are Yellow with a thin Black outline. The 127th Fighter Interceptor Wing, Michigan ANG, had three F-89C squadrons — the 107th FIS at Selfridge, 171st FIS at Detroit Wayne Airport and the 172nd FIS at Battlecreek. (Selfridge Military Air Museum)



This F-89C (51-5777) served with the 57th Fighter Interceptor Squadron and was later transferred to the 132nd Fighter Interceptor Squadron, Maine Air National Guard, before finally ending up here on the ramp at Davis Monthan AFB being prepared for storage and final scrapping. (AFM)





# F-89D Scorpion

The provision for upgrading the Scorpion's armament with rockets had been included in the original all-weather fighter requirements established during 1945. These rockets, however, were the air-to-ground variety carried by most Air Force fighter bombers. The F-89A, B, and C all could carry underwing rocket launchers for the 5 inch HVAR rocket. By 1950, air-to-air rockets were being developed to counter the growing Soviet bomber threat. The Air Force took the threat of a Soviet attack over the North Pole seriously and GEN Whitehead had even considered a variant of the North American B-45 bomber armed with over 300 air-to-air rockets!

The rockets under development were based on the German-designed R-24 air-to-air rocket that had been used against Allied bombers during the Second World War. The rockets that evolved from this development program were designated the 2.75 Inch Folding Fin Aircraft Rocket (FFAR) and named after a popular cartoon character, Mighty Mouse. The rockets had an effective range of about 2,000 yards and a high explosive warhead. Several fighter aircraft were armed with these rockets, including the North American F-86D with an under fuselage retractable tray containing twenty-four FFARs and the Lockheed F-94C with twenty-four FFARs in the nose. Northrop, after studying several options, had decided to arm the F-89D with the FFARs in wingtip pods. Eventually all three fighters would see service in Air Defense Command squadrons during the 1960s, but only the F-89 Scorpion would remain in service through the 1960s.

While the F-86D and F-94C were both armed with twenty-four FFARs, Northrop had designed a pair of wingtip fuel tanks that could carry 104 FFARs in the forward portion of the tanks. These tanks were longer and had a larger diameter than the 300 gallon fuel tanks carried on the F-89C, with the forward third of the tank containing a series of fifty-two launch tubes for the Mighty Mouse rockets. The remaining two thirds of the tank contained 308 gallons of JP-4 fuel. All 104 rockets could be fired at once in 4/10th of a second! If desired, the rockets could also be ripple fired. Under this system the pilot could select two ripples (62 and 42 rockets) or three ripples (42, 32, and 30 rockets). When all 104 were fired, the rockets reportedly blanketed an area the size of a football field and one Mighty Mouse rocket was enough to bring down any Soviet bomber of the era.

Besides the change in armament, the F-89D differed from the F-89C in a number of ways. With the addition of the rockets, the six cannons in the nose were deleted. The entire nose section was redesigned to house the Hughes E-6 Fire Control System with a straight tapered nose cone and larger radome. The E-6 system consisted of a Hughes AN/APG-40 radar (60,000 yard range) and an AN/APA-84 Rocket Ballistics Computer. The space formerly housing the cannon and ammunition bays was used to carry a 262 gallon fuel tank. Additionally, the F-89D could carry underwing fuel tanks, each containing 200 gallons for a total of 2,834 gallons. The increase in fuel brought the combat radius to almost 400 miles. Although this was not great, the range of the F-89D was almost twice that of its contemporaries, the F-86D and F-94C — and the F-89D carried four times their firepower.

An F-89B (49-2463), was pulled from the Northrop assembly line and modified with the recontoured nose, E-6 fire control system, and wingtip rocket pods to serve as the service test prototype. The first flight of the YF-89D was on 23 October 1951, with the first two production F-89Ds being accepted by the Air Force on 30 June 1952. Some 125 F-89Ds had been completed when production was halted in conjunction with the grounding of the entire F-89 fleet. These aircraft remained at Northrop awaiting the wing modifications. The first F-89D unit to become operational was the 18th Fighter Intercep-



**An F-89B (49-2463) was pulled off the production line and converted to the YF-89D prototype. The nose was recontoured to house the Hughes E-6 Fire Control System with its larger, flatter radome and a 260 gallon fuel tank was installed in the area formerly used for the guns. (Northrop)**

tor Squadron based at Minneapolis/St. Paul, Minnesota. The unit was declared combat ready on 7 January 1954.

Engine problems with the Scorpion persisted and, as units built up experience with the F-89D, a number of problems were uncovered. Power drops caused a loss of thrust above 30,000 feet. To cure the problem, several engine changes were accomplished, with no effect. It was finally decided that the temperature sensor element in the power control unit was at fault. After the unit was shielded, the problem was solved. Other problems included corrosion in the rocket tubes, which could cause them to collapse and lead to an explosion during rocket firing. A new thick-walled tube was designed and installed which cured the problem.

Most of the air defense missions in the 1950s were usually pretty dull. Pilots stood alert duty for 24 hours, waiting for the scramble alarm to signal a sudden takeoff. Normally, the bogie ended up being an off-course airliner or some Canadian fishermen ducking under the weather. Of course there were a number of exciting missions as well. One such mission was the night that a fully armed F-89D of the 465th FIS was about to scramble on a multiple-bogie target coming in from the north. Russian bombers enroute to American targets? No, just seven fishermen heading back to the U.S., flying wingtip to wingtip and creating a much larger radar image than normal. Another time the 433rd scrambled on several multiple bogies approaching from the north which turned out to be flocks of Canadian Geese on their southern flight. Alaskan Air Command squadrons were scrambled to intercept real Soviet aircraft, that were "lost" and penetrating U.S. air space. Then there were the UFO scrambles which were always interesting. Reportedly, more than one of those turned out NOT to be a weather balloon!

During October of 1953, the Air Force considered arming the F-89D with the Hughes





The YF-89D was the first Scorpion to have combination wingtip fuel/rocket tanks. These tanks carried fifty-two 2.75 inch Mighty Mouse FFARs in the forward third of the tank with 308 gallons of fuel being housed in the rear two thirds. (Barry Miller)

The YF-89D fires a salvo of the 2.75 inch FFARs on a test flight. All 104 rockets could be fired at once, or the pilot had the option to fire the rockets in volleys called ripples. The fire control system allowed for either two or three ripples to be selected. (Northrop)

GAR-1 Falcon air-to-air missile. Three F-89Ds were modified to carry the Falcon internally in experimental wingtip tanks. Problems with the tanks collapsing led to the project being shelved until new tanks could be designed. The first successful live fire kill by a Falcon was on 27 January 1955 when a modified F-89D shot down a QB-17 drone target.

The F-89D was the most numerous Scorpion variant built by Northrop, with 682 aircraft being produced at a flyaway cost of \$801,602.00 each. The F-89D served in the Air Defense Command, Alaskan Air Command, and Northeast Air Command until late 1958 when they began to be transferred to the Air National Guard. The last active Air Force unit to operate the F-89D was the 57th FIS at Keflavik, Iceland, who transitioned to Convair F-102As in July of 1962. The first Air National Guard unit to equip with the F-89D was the 178th FIS, North Dakota ANG, based at Fargo.







New production F-89Ds undergo final assembly on the ramp at the outdoor assembly area of Northrop's Ontario, California, facility. The F-89Cs in the background are undergoing modification with new strengthened wings and attachment fittings. (Northrop)



An early production F-89D was posed on the ramp with its full load of rockets lined up in front of it. One hit from a 2.75 inch FFAR was capable of bringing down any Soviet bomber then in service. (Northrop)

An F-89D fires a ripple of rockets on a test flight over a desert firing range. The smoke cloud caused by firing the entire load of 104 rockets could temporarily blind the crew. (Northrop)



## Nose Development

### F-89C

Long tapered nose

Six cannons

### F-89D

Less tapered nose

Enlarged radome

Cannons deleted

Radar equipment bay





A lineup of F-89D-15s of the 3550th Combat Crew Training Wing (Interceptor) at Moody AFB during March of 1957. The 3550th was responsible for training of both air and ground crews for F-89 operational units. The placement of the buzz number on the nose is unusual. (via Marty Isham)

The North American Aviation F-86D Sabre Dog and Lockheed F-94C served alongside F-89s in ADC. The F-86D was an all weather variant of the F-86 day fighter and carried twenty-four 2.75 inch FFARs in a retractable tray under the fuselage. The F-86D had a redesigned nose with a large radome and underslung air intake. (North American)

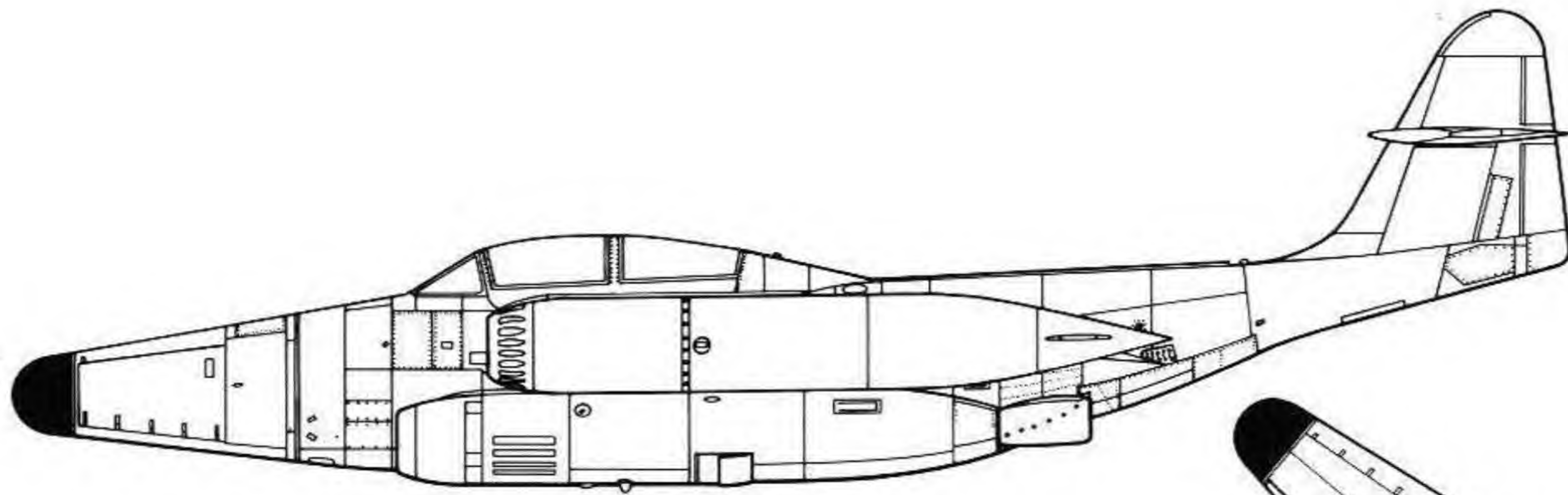


Even though the 2.75 inch rocket was the standard armament for the Scorpion, the Air Force continued to experiment and evaluate other weapons for the F-89, such as the 30mm Oerlikon cannon. These weapons had a rate of fire of 937 rounds per minute per gun. (David Menard)

The Lockheed F-94C Starfire was developed from the F-80C Shooting Star day fighter and was armed with twenty-four FFARs carried internally around the nose. These were later augmented with another twenty-four rockets carried in mid-span wing leading edge pods. (Lockheed)







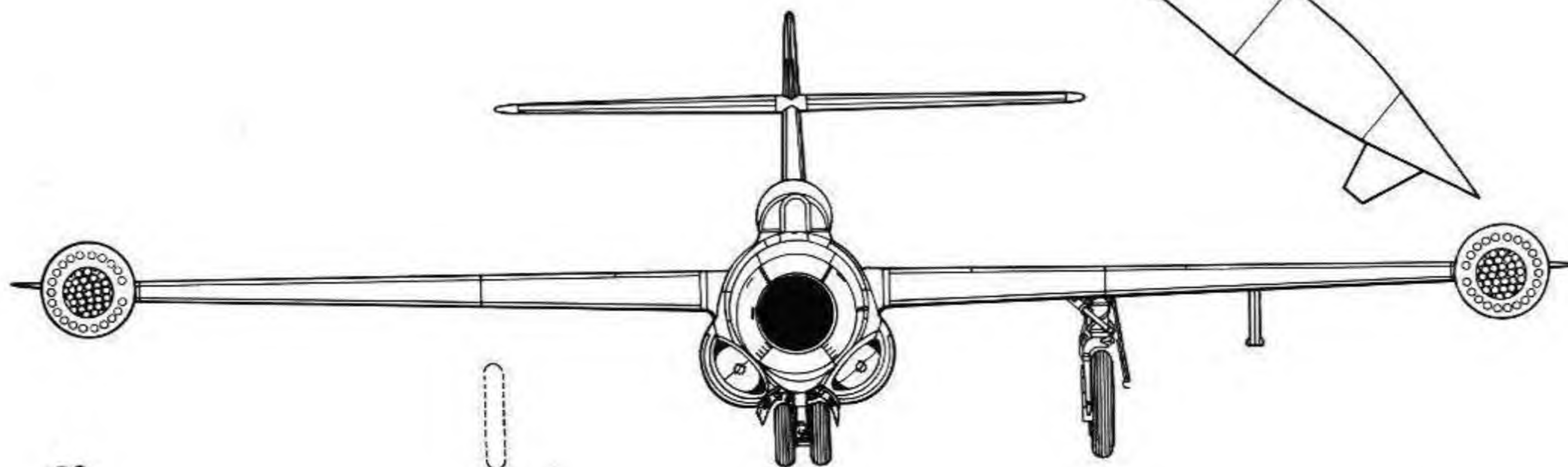
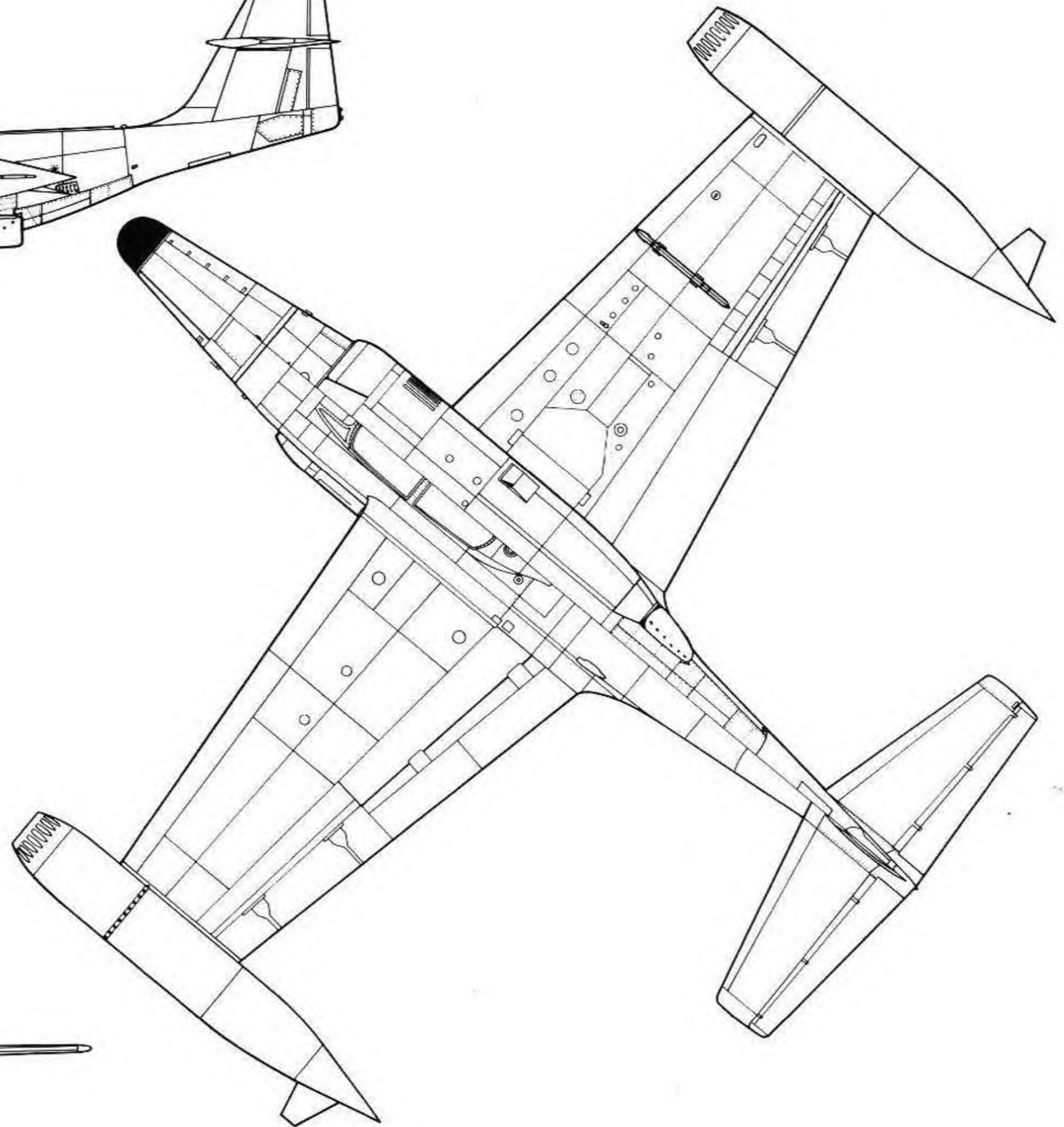
## Specifications

### Northrop F-89D Scorpion

**Wingspan** ..... 59 feet 8 inches  
**Length** ..... 53 feet 10 inches  
**Height** ..... 17 feet 6 inches  
**Empty Weight** ..... 24,000 pounds  
**Maximum Weight** ..... 41,000 pounds  
**Powerplant** ..... Two 7,200 lbst Allison J35-A-33A turbojet engines.

**Armament** ..... 104 2.75 inch Folding Fin Aircraft Rockets (FFARs)

**Performance**  
**Maximum Speed** ..... 636 mph  
**Service ceiling** ..... 50,000 feet  
**Range** ..... 2,600 miles  
**Crew** ..... Two







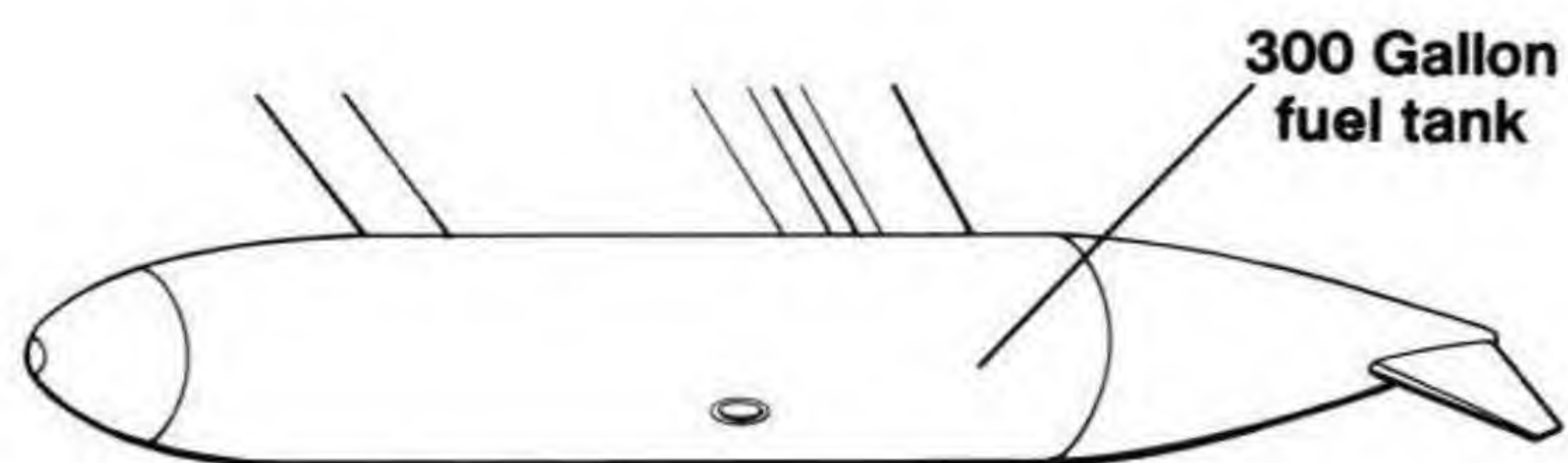
An F-89D Scorpion of the 64th FIS taxis out to the active runway at Elmendorf AFB, Alaska, during May of 1955. There were a total of six F-89 equipped squadrons assigned to the Alaskan Air Command. (USAF)



An F-89D of the 18th Fighter Interceptor Squadron, Alaskan Air Command, parked on the ramp at Ladd AFB during May of 1957. The Alaskan Air Command was a separate command and was responsible for the defense of the Alaskan territories. (A/2C David Menard)

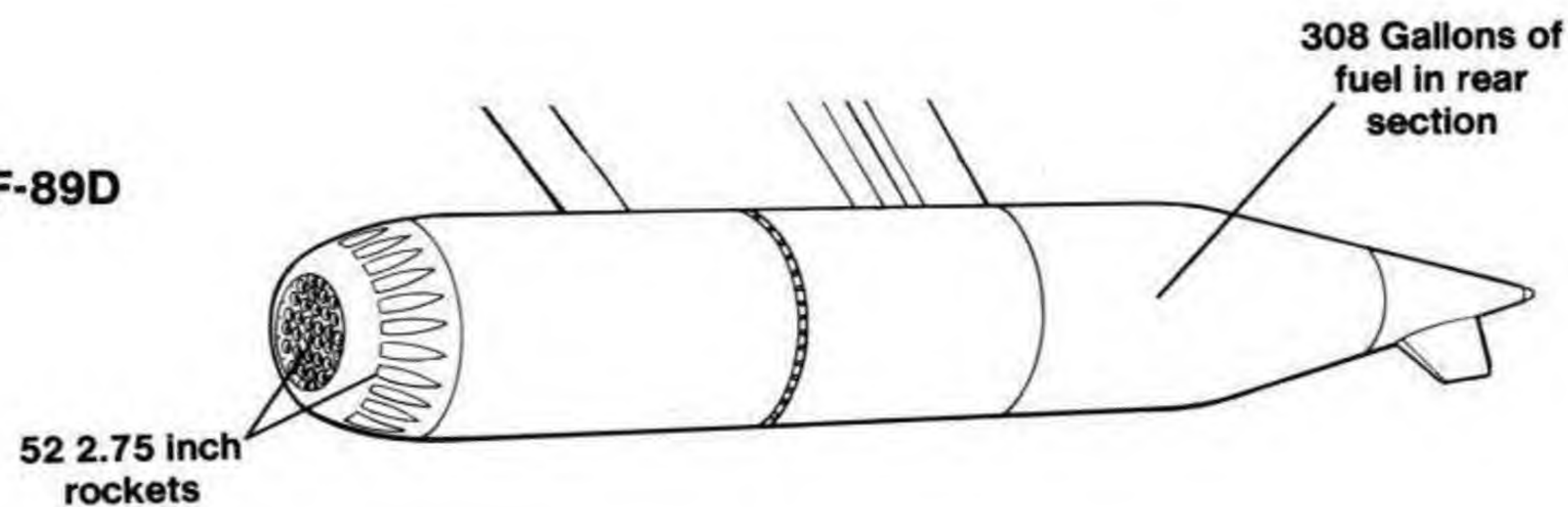
## Tip Tanks

F-89C



300 Gallon  
fuel tank

F-89D



308 Gallons of  
fuel in rear  
section

52 2.75 inch  
rockets

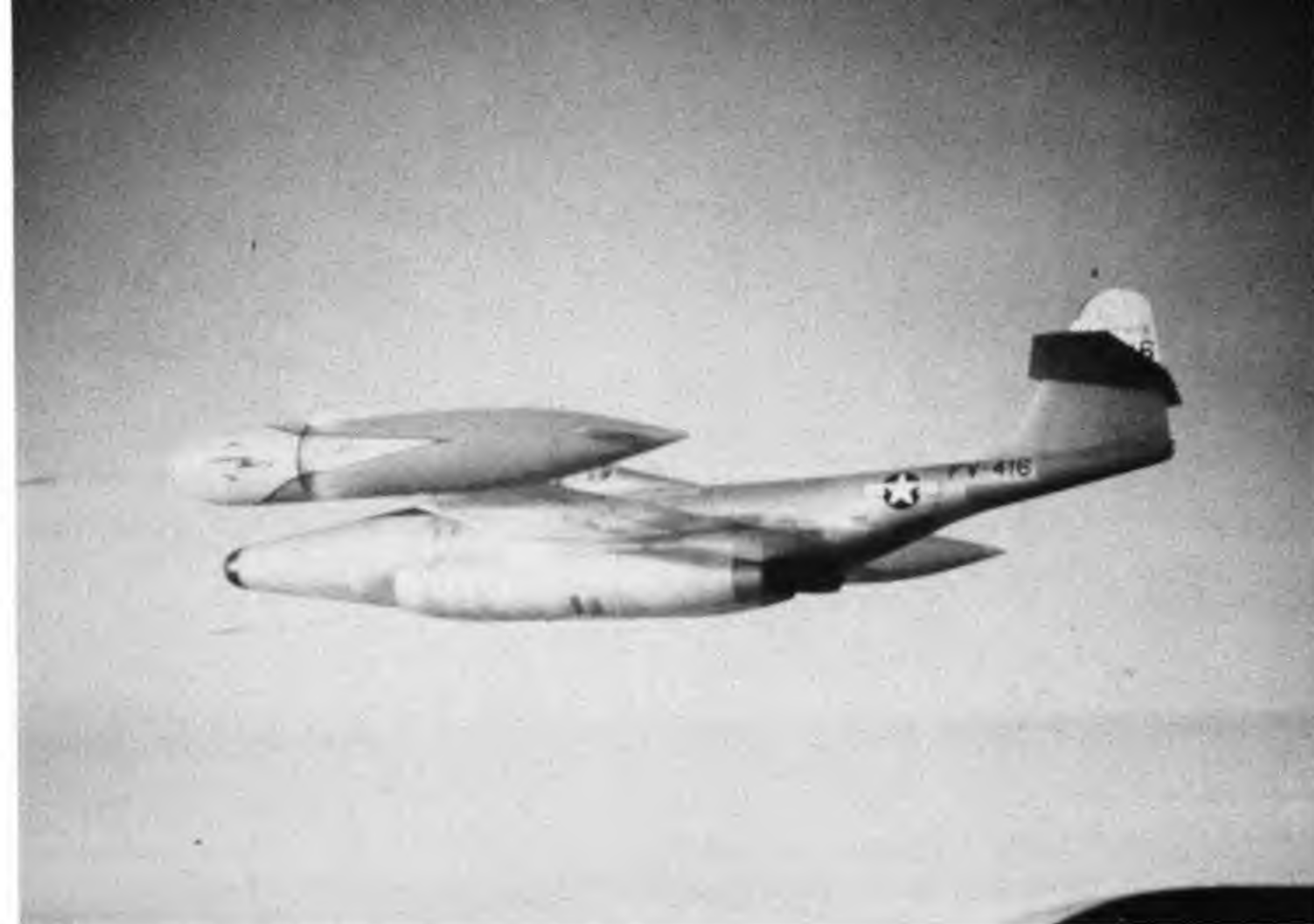
An F-89D of the 438th FIS shares the ramp at the Dayton International Air Show, with the Bell X-1A. The nose area, containing the radar and electronic gear, has been painted with a Silver lacquer as an anti-corrosion measure. The bands on the nose and rudder are Red and White. (Marty Isham)







**SWING SHIFT SKIPPER II** was an F-89D of the 64th FIS and was the second Northrop aircraft to carry that name. CAPT Art Bourque had flown a Northrop P-61B with the 547th NFS on Lingayen during the Second World War. He was credited with two Japanese fighter kills during 1945. (LTCOL Art Bourque)



An F-89D of the 66th FIS fires a salvo of 2.75 inch Mighty Mouse rockets over the Yuma gunnery range. The 66th FIS was based at Elmendorf AFB, Alaska, as part of the Alaskan Air Command. The wing tank markings are Yellow with Black lightning bolts and a thin Black outline. (USAF)

An F-89D of the 66th FIS parked on the slush covered ramp at Elmendorf during the Spring of 1955. The F-89 was well liked by the aircrews of the Alaskan Air Command (AAC) and Northeast Air Command (NEAC) because of its twin engine reliability. Crews did not relish the thought of going down in the sparsely populated Arctic areas. (USAF)

Every time the aircraft was changed during development, whether it was in electronics, engines or armament, cold weather tests were performed on the aircraft in the climatic hangar at Eglin AFB. Here the temperature could be dropped to -65 degrees, simulating the Winter weather in Iceland or Alaska. (Northrop)





The XP-89 prototype was painted overall Flat Black and carried a large test instrument probe attached to the radome.



An F-89C of the 84th Fighter Interceptor Squadron at Hamilton AFB, California, during 1953.



An F-89C of the 57th Fighter Interceptor Squadron during the 1953 Yuma Gunnery Meet carries a flight leader's stripe on the rear fuselage.



This F-89D of the 437th FIS won the F-89 competition at the 1956 Yuma Rocketry Meet.

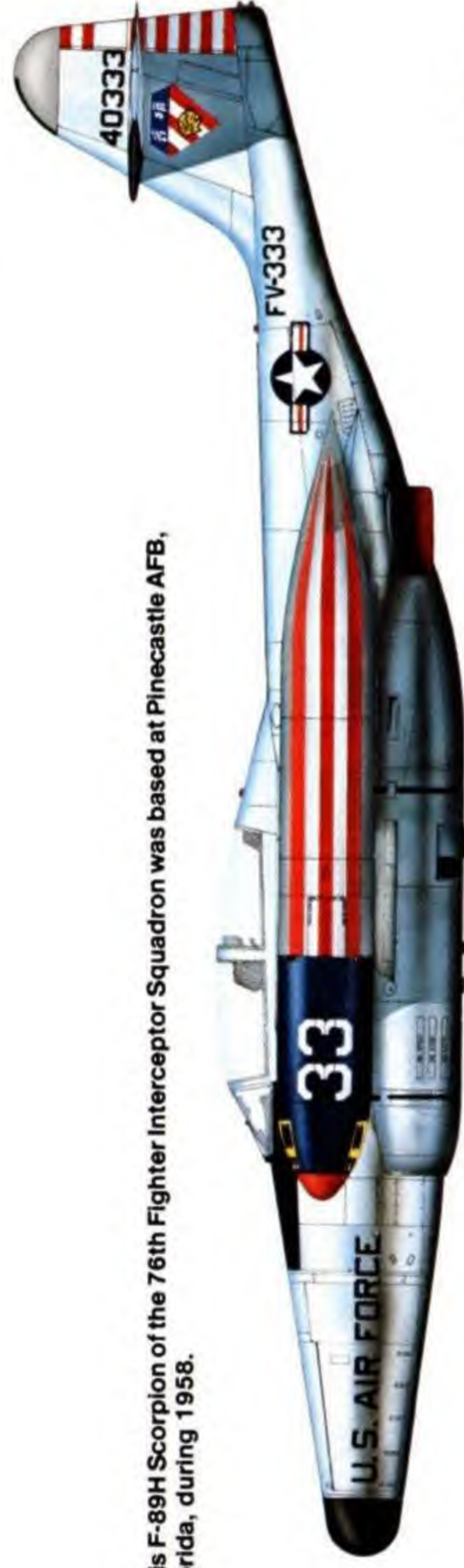


The Texan "A", was an F-89D of A Flight, 61st FIS based at Ernest Harmon AFB, Newfoundland, during 1955.





This F-89H Scorpion of the 76th Fighter Interceptor Squadron was based at Pinecastle AFB, Florida, during 1958.



*SWING SHIFT SKIPPER II*, was an F-89D of the 64th FIS at Elmendorf AFB, Alaska, flown by CAPT Arthur Bourque during 1956. The aircraft was the second Northrop fighter to carry the name, the first being a P-61B Black Widow.



This sharkmouthed F-89D was assigned to the 75th Fighter Interceptor Squadron, 23rd Fighter Interceptor Wing based at Presque Isle AFB, Maine, during 1958.



An overall ADC Gray F-89J Scorpion of the 124th FIS, Iowa Air National Guard based at Sioux City Airport, Sioux City, Iowa, during 1969.



This F-89J of the 179th FIS, Minnesota ANG is the Squadron Commander's aircraft and is in overall ADC Gray. The 179th was based at Truax AFB during 1965.







An F-89D of the 59th FIS on the ramp at Goose Bay, Labrador. During the peak years of service, thirty of the thirty-nine F-89 squadrons were based in the northern U.S. or in Canada to defend against a possible Soviet bomber attack over the Pole. The markings of the 59th FIS were Yellow with Black stripes and a Black bat. (Don Garrett)



'A' The TEXAN, an F-89D of the 61st Fighter Interceptor Squadron, taxis out at Ernest Harmon AB, Newfoundland during 1956. The large Yellow A on the tip tank stood for A flight. The Red Arctic markings are very faded, which was common in the harsh weather of the northern bases. (Saul Kitz)

A pair of shark mouthed F-89Ds of the 61st FIS fly formation over Newfoundland during 1956. The 61st FIS was descended from the 56th Fighter Group (Zemke's Wolfpack) of Second World War fame. The underwing and tail markings were outlined in natural metal to help them stand out against the Arctic Red markings. (Nelson via Menard)



A flight of F-89Ds of the Northeast Air Command (NEAC) Rocket Team enroute to the Yuma Gunnery Meet during 1955. Originally, the Yuma meet was not a competition, just a live fire training exercise. The natural competition at Yuma was so intense; however, that the Air Force decided to give awards to the high scoring crews. This led to the William Tell Meet now held at Tyndall AFB. (Blake Morrison via Marty Isham)



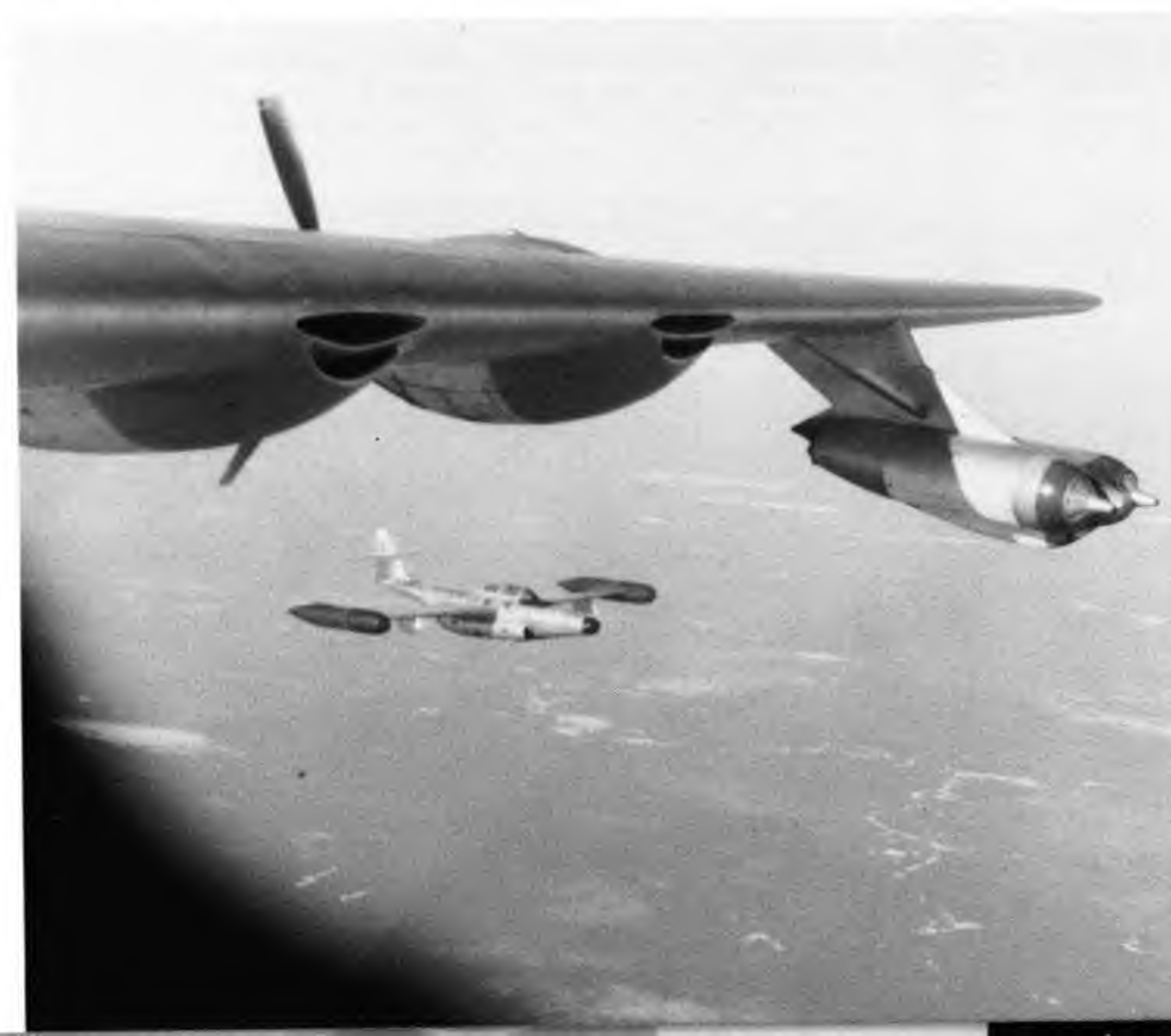




An F-89D of the NEAC Rocket Team on the ramp at Yuma AFB during 1955. Select crews from throughout NEAC were chosen to represent the Command at the 1955 Yuma Gunnery Meet. Each squadron had its colors on the nose. The 59th FIS (Goose Bay, Labrador), 61st FIS (Ernest Harmon AB, Newfoundland), and the 74th FIS (Presque Isle, Maine). Separate competitions were held for the F-86D, F-89D and F-94C. (Barry Miller)

An F-89D from the Alaskan Air Command escorts a Convair B-36 with a feathered outboard engine. Many of the missions flown by Air Defense Command crews were humanitarian in nature, escorting disabled aircraft to the nearest base or finding lost aircraft. (USAF)

This F-89D is assigned to the 4750th Test Group at Tyndall AFB, Florida. The 4750th was responsible for tactics training in the F-89 and training crews in changes in the aircraft's systems and equipment. The small hole in the rear of the tip tank is the fuel dump pipe. (David Menard)







A 321st FIS F-89D flies high over the mountains near its home base at Paine AFB, Washington. Although the 321st FIS often flew missions over Canada or other Arctic areas, the squadron was not required to carry Arctic Red markings. (James Ford)

This F-89D of the 433rd Fighter Interceptor Squadron on the ramp at Ladd AFB during July of 1957 had external screens placed over both the engine air intakes and auxiliary air intake doors on the sides of the engine nacelles. (David Menard)



A late production Block -65 F-89D of the 437th FIS on the ramp at Oxnard AFB, California. The huge size of the F-89D is apparent when compared to Mr. Herb Williams, the Northrop tech rep. The markings of the 437th Tigers were initially Bright Green and Black; however, this was later changed to Yellow and Black (who ever heard of a Green Tiger?) (Herb Williams)







An F-89D of the 437th FIS parked on the ramp at Oxnard AFB ramp during 1956. The aircraft carries Black and Yellow Tiger markings. F-89 squadrons carried some of the most colorful markings ever seen on Air Force and National Guard aircraft. (Gordon Greer)



This J35-A-35 engine has been lowered using the internal hydraulic system of this 433rd FIS F-89D at Ladd AFB. During the early days of F-89 operations, crew chiefs and mechanics had to lower the engines onto mattresses when doing engine changes since dollies were in short supply. (John Finiello)

A lineup of F-89Ds parked on the 321st Fighter Interceptor Squadron ramp at Paine AFB during 1957. The forward portion of the tip tanks was Light Blue with six Yellow stars, while the rear section of the tank was Black with a Yellow flash. (James Ford)



Small sheds were built in cold climates to shield aircraft and maintenance personnel during non-major equipment maintenance. Some of the electronic gear carried on the F-89 was sensitive to cold and had to be kept warm during testing. This shed fits perfectly around a 433rd FIS F-89D at Ladd AFB. (John Finiello)

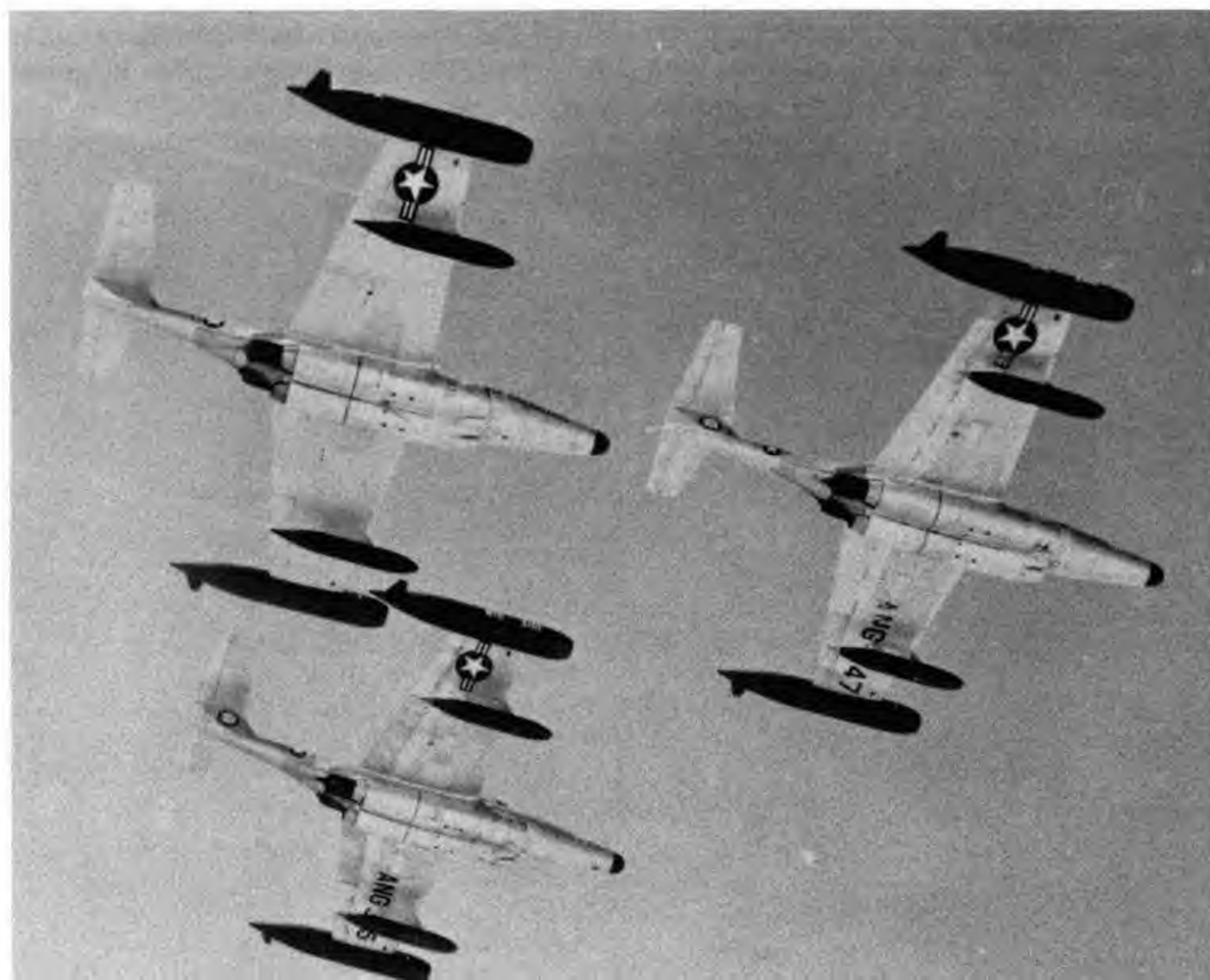






A flight of Wisconsin Air National Guard F-89Ds display the typical Air Guard underwing markings. The national insignia was placed outboard of the wing pylon. ANG and the last three digits of the serial replaced USAF on the opposite wing. The upperwing markings were the same. (Danny Jenkins)

This colorful F-89D was assigned to the 178th Fighter Interceptor Squadron, North Dakota ANG based at Fargo, North Dakota. The 178th Fighter Interceptor Squadron converted to F-89Ds during June 1958. The tip tanks were Black with a Red and White flash and the 178th FIS insignia. (Marty Isham)



This F-89D of the 84th Fighter Interceptor Squadron, 78th Fighter Interceptor Wing is plugged into an external power cart on the ramp at Hamilton AFB, California during 1955. The tail band is Yellow with a thin Black outline and Black 78th FIW badge. The tip tanks are Black with a Yellow stripe and carry the 84th FIS Black Panther badge. (David Menard via Marty Isham)







This F-89D of the 57th Fighter Interceptor Squadron was unusual in that it carried 600 gallon wing tip fuel tanks in place of the standard rocket/fuel tanks. The extra fuel was needed for the long flight to Iceland. The aircraft carries the Military Air Transport System (MATS) insignia on the nose since the 57th FIS was the only fighter unit ever assigned to MATS. (David Menard)

A Black and White checkerboard tailed F-89D of the 176th Fighter Interceptor Squadron, 128th Fighter Interceptor Group, Wisconsin Air National Guard on the snow covered ramp at Truax AFB. The Wisconsin ANG received their first F-89s during April of 1952. (Don Garrett)



The South Dakota Air National Guard was the first Air National Guard squadron to convert to the F-89D. Based at Sioux Falls, the 175th Fighter Interceptor Squadron/114th Fighter Interceptor Group transitioned into the F-89D during 1958 (the unit later converted to F-102A Delta Daggers during 1960). (Art Krieger via David Menard)

This F-89D was on loan (called bailment) to the U.S. Army and was used as a launch aircraft for the Radioplane AP-71 target drone. The aircraft was equipped with 600 gallon wingtip fuel tanks and carried the emblem of the U.S. Army Missile Command on the tail. (Ben Knowles)





# F-89E, F-89F and F-89G Proposals

There were several experimental F-89 designs and proposals that, while considered by the Air Force and given designations, were never placed into production. The F-89E was to be an F-89D re-engined with a 9,700 lbst Allison J71 non-afterburning turbojet engine. The J71 would give the F-89 greater power and a far better fuel consumption, greatly increasing its range. Although one F-89C airframe was modified to serve as the XF-89E prototype, the project was abandoned before reaching production. The XF-89E continued to fly, being used by the Air Force as an engine test bed.

Later, a second project was also given the designation F-89E. This aircraft was designed to meet the requirements of the Interim Escort Fighter Program. The escort fighter was a single seat design, powered by two 9,100 lbst J47-GE-21 engines (the same engines used on the Boeing B-47 bomber). The wings differed from the F-89D in that they were greatly enlarged with a swept leading edge. Armament consisted of 108 FFARs in large weapons/fuel pods mounted at mid-span on the wing. Additionally, these pods also housed the aircraft's twin wheeled main landing gear. The nose could also carry alternative armament loads such as ten .50 caliber machine guns, six 20MM cannons, or six MX-904 rockets. Projected performance for the F-89E was a top speed of 688 mph and a combat radius of 1,010 miles. The project failed to progress beyond the design study stage.

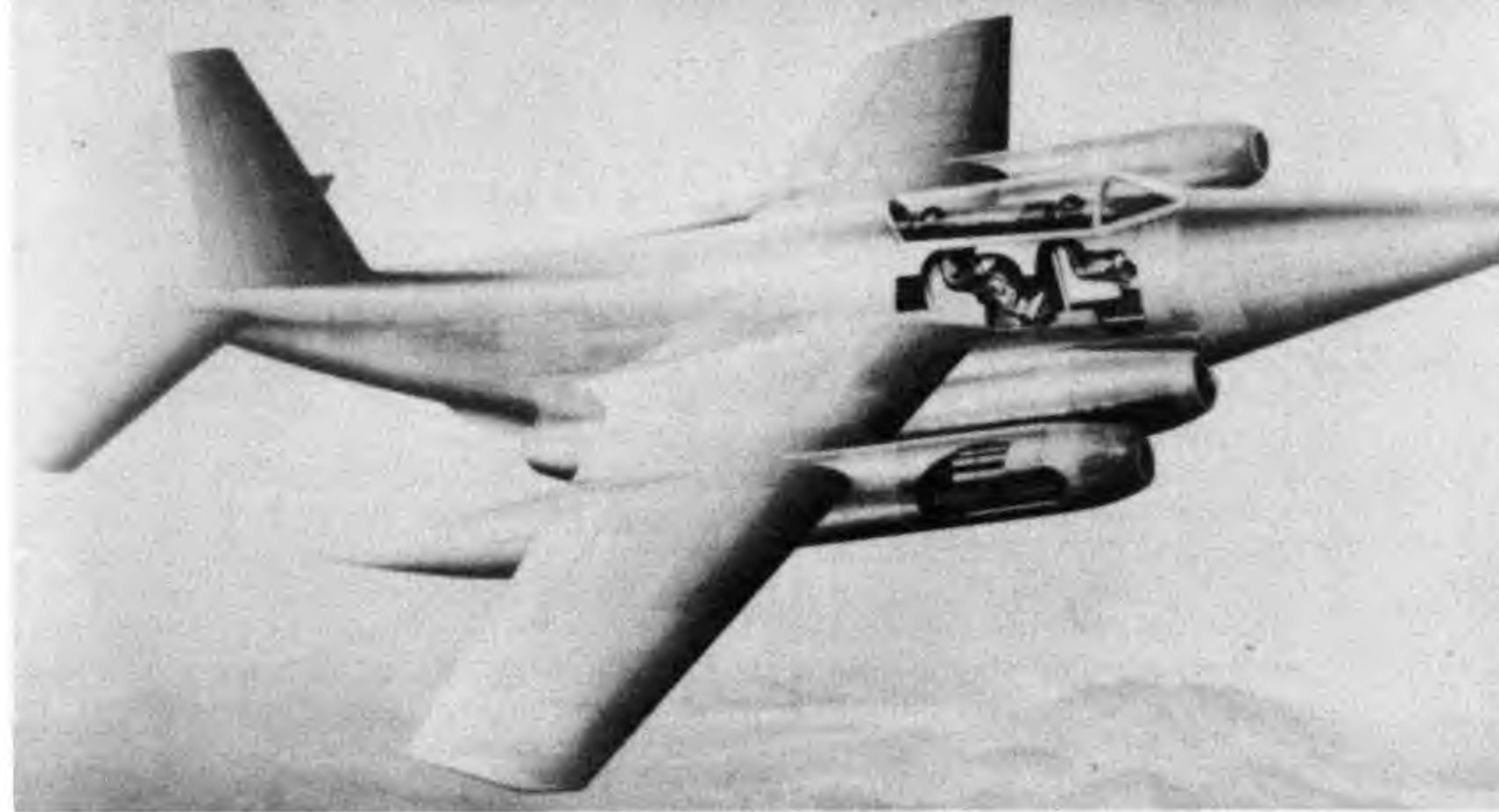
The F-89F proposal was also known as the Advanced F-89 and was to be powered by two 9,100 lbst J47 engines. The aircraft had a wing span of fifty-nine feet four inches, a length of fifty-nine feet six inches and a height of twenty-one feet. The wing was enlarged with a swept leading edge and the same mid-span weapons/fuel pods (with different weapons) as the F-89E. The fuselage was deepened and faired straight back from the canopy to the vertical fin. The horizontal stabilizers were relocated from the fin to the fuselage at the base of the fin. Armament was to be six Falcon air-to-air missiles and forty-two 2.75 inch FFARs housed in the front of the weapons/fuel pods, while the rear portion housed some 900 gallons of fuel. A mock-up was built; however, as the aircraft's projected gross weight continued to rise and its performance fell, the Air Force lost interest in the project and it was cancelled during August of 1952.

The F-89G was to be quite similar to the F-89F, but retain the 7,200 lbst J35-A-35 engines used on late model F-89s. The aircraft was to carry the Hughes MA-1 fire control system that had been developed for the XF-106 project and be armed with Falcon air-to-air missiles. The F-89G never progressed beyond the design study phase.

Two other design proposals based on the F-89 were presented to the Air Force by Northrop. One was a swept wing variant powered by two 10,000 lbst Allison 450E-1 engines. The wing was a conversion of the standard F-89A wing, swept back at a 35 degree angle. With the more powerful engine and swept wing, it was estimated that this Scorpion would have a top speed of 731 mph and a service ceiling in excess of 63,000 feet.

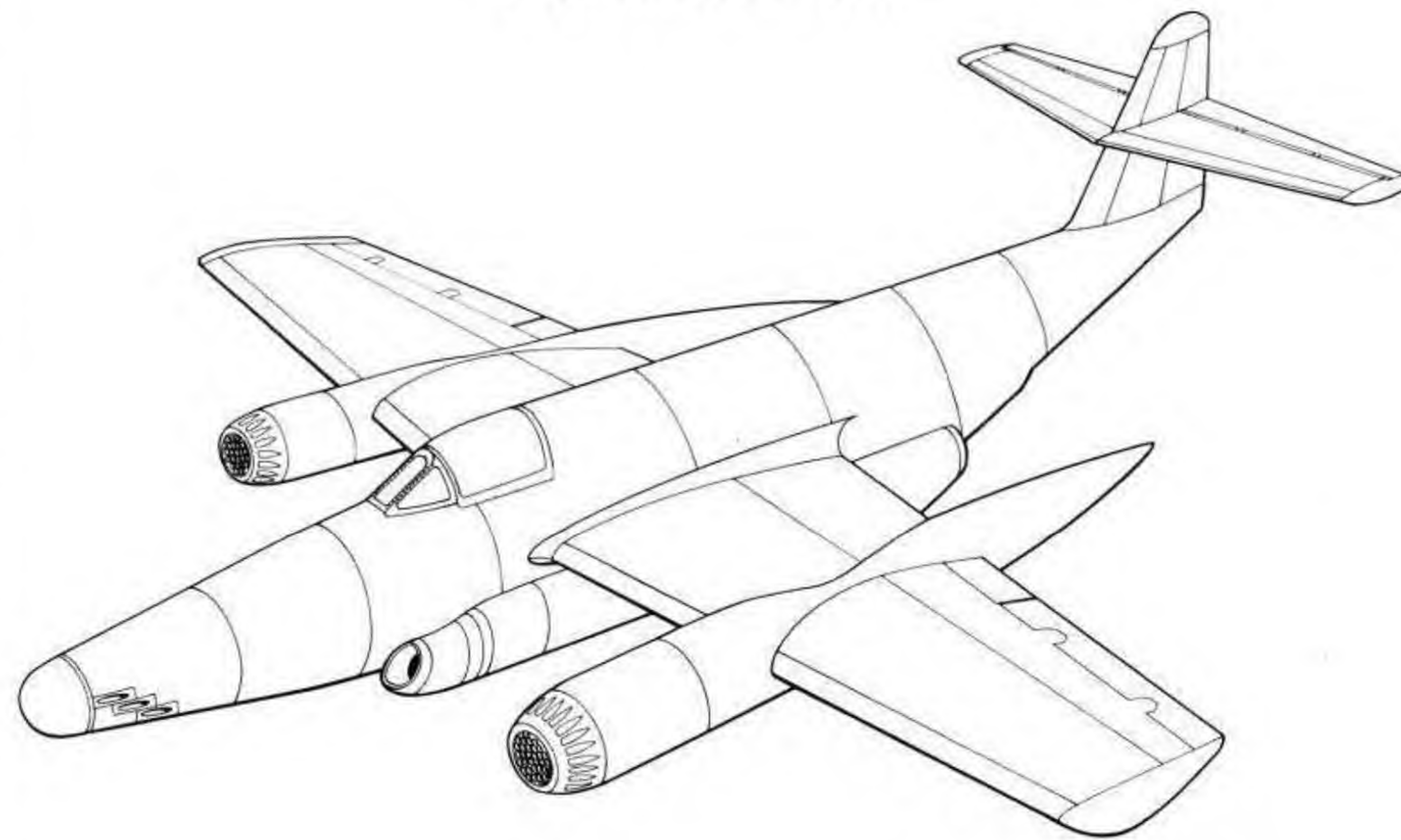
The other proposal was a radical delta-winged configuration powered by either Allison J67 or J71 powerplants. The delta Scorpion was to be armed with 204 2.75 inch FFARs or eight Falcon air-to-air missiles along with forty-two FFARs, or two 20MM Gatling type rotary cannons. Regardless of the armament selected, it was all to be carried in wing mounted pods. The delta-winged version was estimated to have a top speed of 1,050 mph at 45,000 ft.

Neither the swept or delta winged variants of the Scorpion made it past the proposal stage before they were cancelled, although drawings do exist of both configurations.



An artist's conception of what the F-89F would have looked like, had it been built. The F-89F was to have been armed with 108 2.75 inch FFARs in mid-span weapons/fuel pods. The aircraft was to be powered by two 9,100 lbst J47 turbojet engines.

Proposed F-89E  
Single Seat Scorpion





# F-89H Scorpion

The F-89H was a direct outgrowth from the failed F-89G program, which had intended to mate the Hughes MA-1 fire control system and Falcon air-to-air missile with an upgraded F-89 airframe. With the cancellation of the F-89G proposal, Northrop decided to upgrade the F-89D with the Hughes E-9 (a simplified MA-1) fire control system and Falcon air-to-air guided missiles. The Air Force agreed and three F-89Ds were modified and used to test the weapons systems changes. Only one of these (serial 52-1938) was designated as the YF-89H. After a short test period, the aircraft was ordered into production during March of 1954 under the designation F-89H.

The F-89H differed from the F-89D in two areas — the weapons carried and the fire control system. The wingtip pods of the F-89D were redesigned and enlarged with the forward third of the pod containing six weapons compartments. Three of these compartments held a single Hughes GAR-1 Falcon air-to-air missiles. The GAR-1 Falcon was a radar beam riding missile (although later variants had infrared seeker heads) weighing 134 pounds. It was supersonic, had a range of approximately six miles (about five miles greater than the FFAR) and a high explosive warhead. The Falcons were stored inside the modified wingtip pods until ready for firing. When ready to fire, the Falcons swung out on individual three arm launchers through a pair of fairing doors on the pods.

The other three weapons compartments each contained seven 2.75 inch FFAR launcher tubes, giving each pod a total of twenty-one Mighty Mouse FFARs. The total weapons load for the F-89H was six GAR-1 Falcons and forty-two 2.75 inch FFARs. As the aircraft entered service, the GAR-2A infrared variant of the Falcon missile became available and it became normal practice for the Scorpion to carry three radar and three IR guided Falcons.

The fire control system (FCS) was upgraded with the Hughes E-9 FCS which included a universal computer that made it possible for the pilot to select the best mode of interception, either a lead pursuit course (for use with FFARs only) or a lead collision course (when firing Falcons and/or FFARs). Problems developed with both the Falcon pods and the E-9 FCS. The pods suffered from the same initial problems as had the earlier F-89D pods: corrosion in the missile cavities which could lead to a misfire or explosion. The E-9 FCS had a number of minor technical problems that needed to be worked out before the system was able to get the maximum performance from the Falcon missiles. Luckily, these problems proved to be relatively minor and were soon solved.

The F-89H was the final production variant of the F-89 to come from the Hawthorne, California, plant. The Air Force accepted the first production F-89H during September of 1955, but it was not until March of 1956 that the first F-89Hs became operational with the 445th Fighter Interceptor Squadron at Wurtsmith AFB, Michigan. The scheduled deployment of the Falcon-armed interceptor was almost two years late. The last, of a total of 156 F-89Hs produced (at a flyaway cost of \$988,884.00), came off the Hawthorne assembly line in August of 1956.

Active Air Force service life for the F-89H was relatively short due to the rapid advancements being made in the supersonic interceptor programs — mainly with the Convair F-102A Delta Dagger. This aircraft also used the Falcon as its primary armament. In November of 1957, the first F-89H was transferred to the Air National Guard entering service with the 123rd Fighter Interceptor Squadron, Oregon ANG at Portland. By September of 1959, all active duty Air Force F-89H fighters had been passed to Guard units.

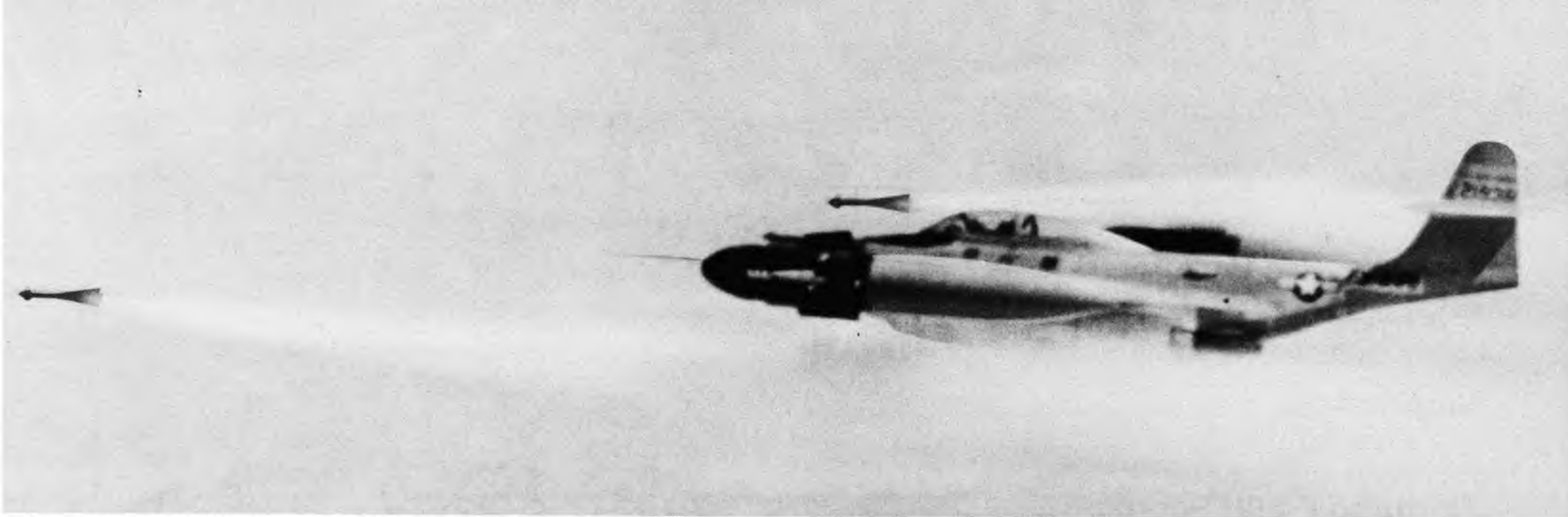


One of three F-89Ds that were converted to test the wingtip weapons/fuel pods that were configured to carry the Hughes Falcon air-to-air missiles, which would be the primary armament for the F-89H. The Falcons were carried inside the pods until ready for firing. (Barry Miller)

This F-89H was used by Northrop as a demonstrator and public relations aircraft at air shows throughout the country. Although it had the appearance of a prototype, it was actually the sixteenth F-89H off the Northrop assembly line. Northrop built a total of 156 F-89Hs. (Barry Miller)





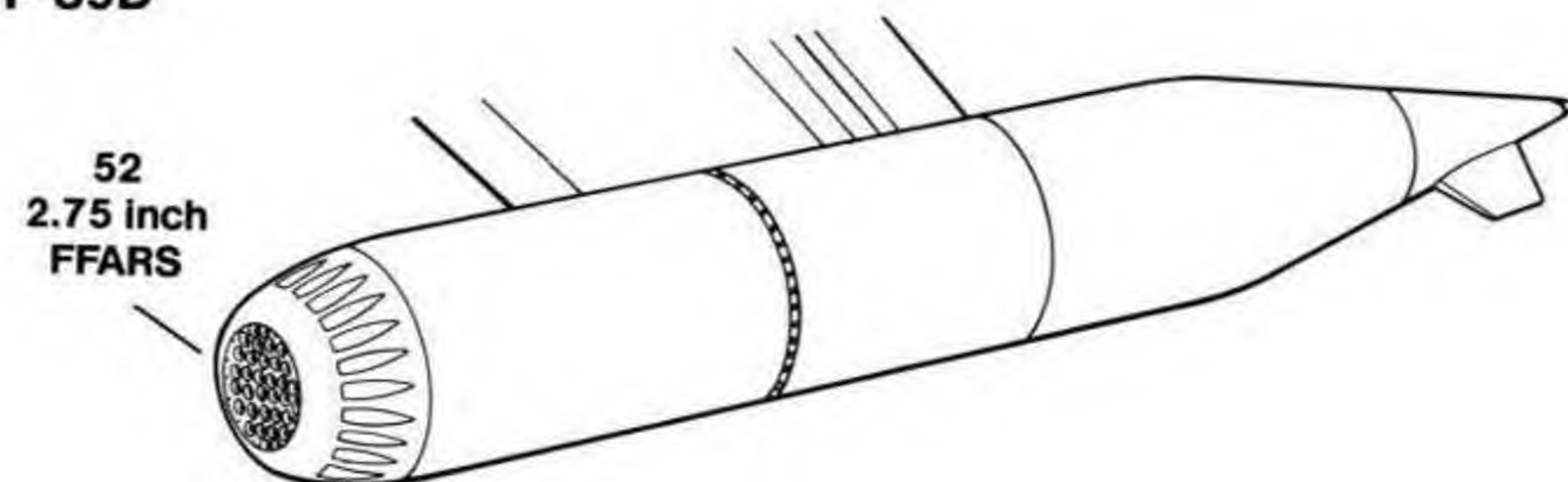


The YF-89H, one of the F-89Ds converted to F-89H standards as a Falcon missile test aircraft, fires two Falcons over the test range. In addition to the three GAR-1 Falcons, the F-89H also carried twenty-one FFARs in each wing tip pod. The total missile/rocket load was six Falcons and forty-two FFARs. (Barry Miller)

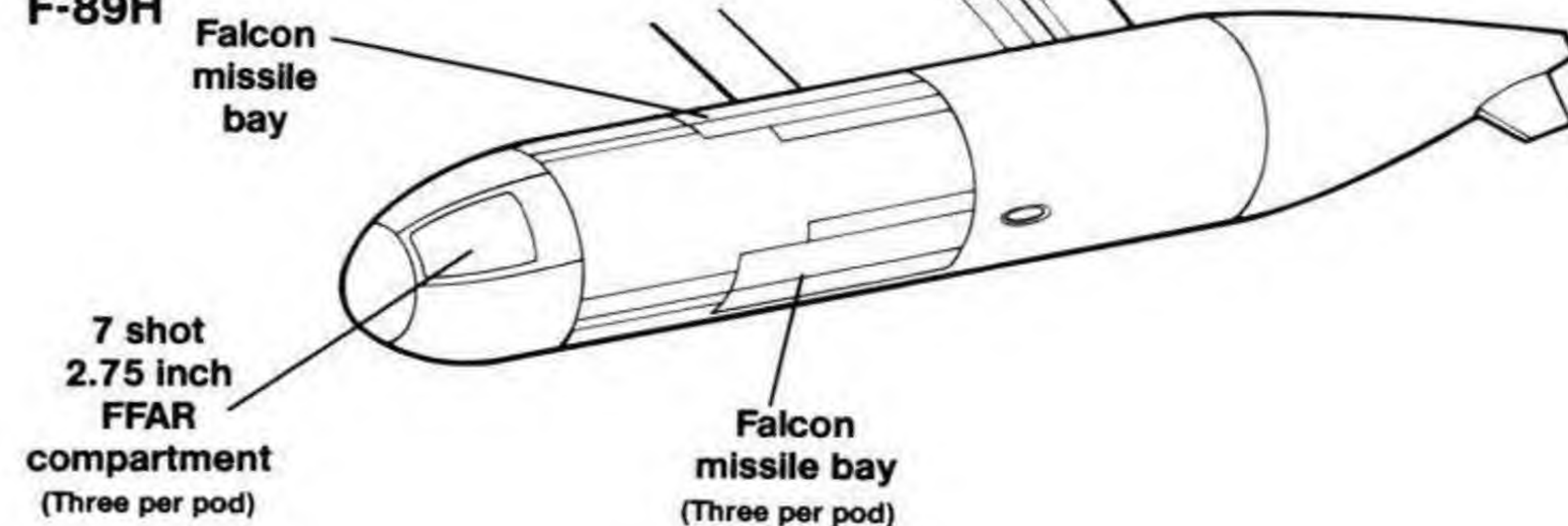
The Falcon missile bay had two fairing doors and a three rail launcher for the missile. These GAR-1 missiles are inert test airframes and are painted overall Light Blue. (AFM)

## Weapons/Fuel Pods

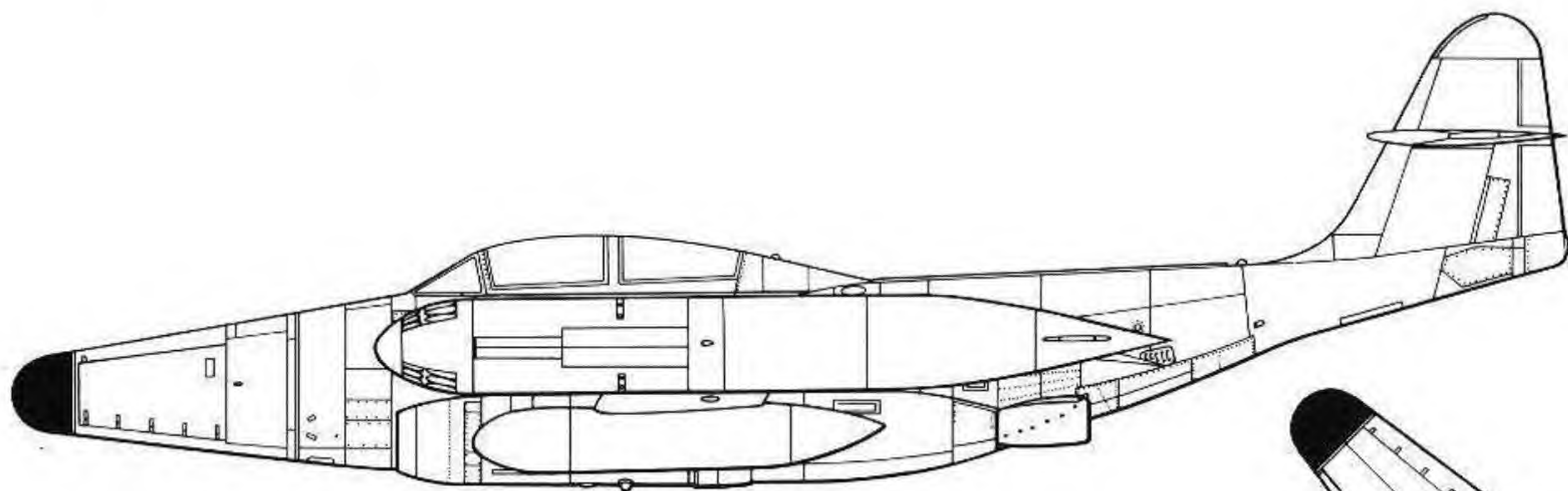
### F-89D



### F-89H







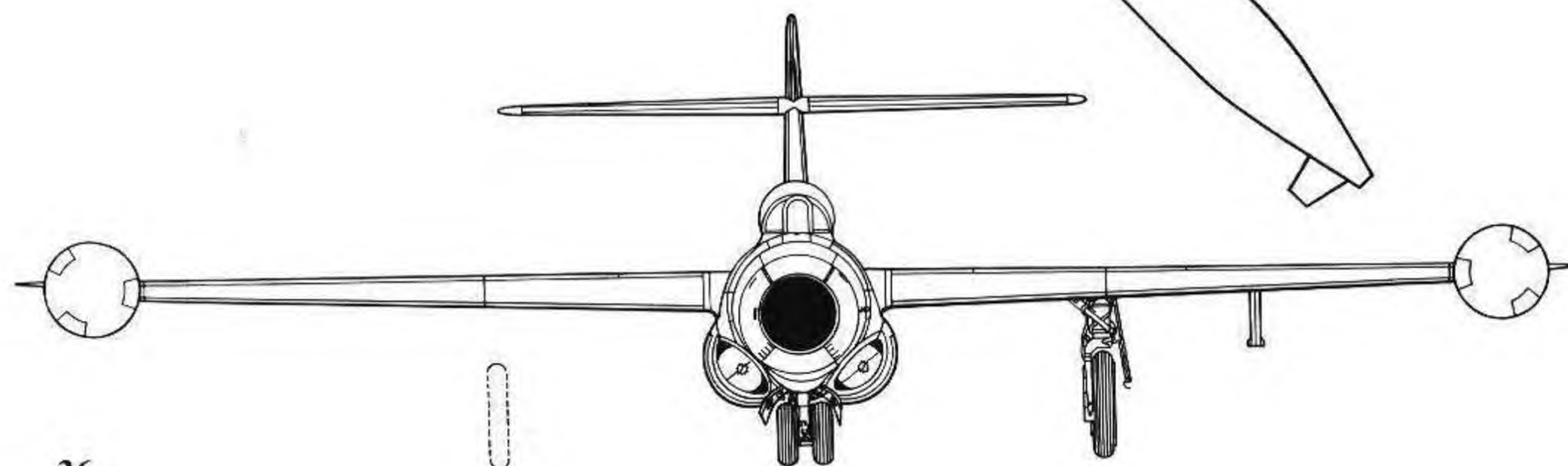
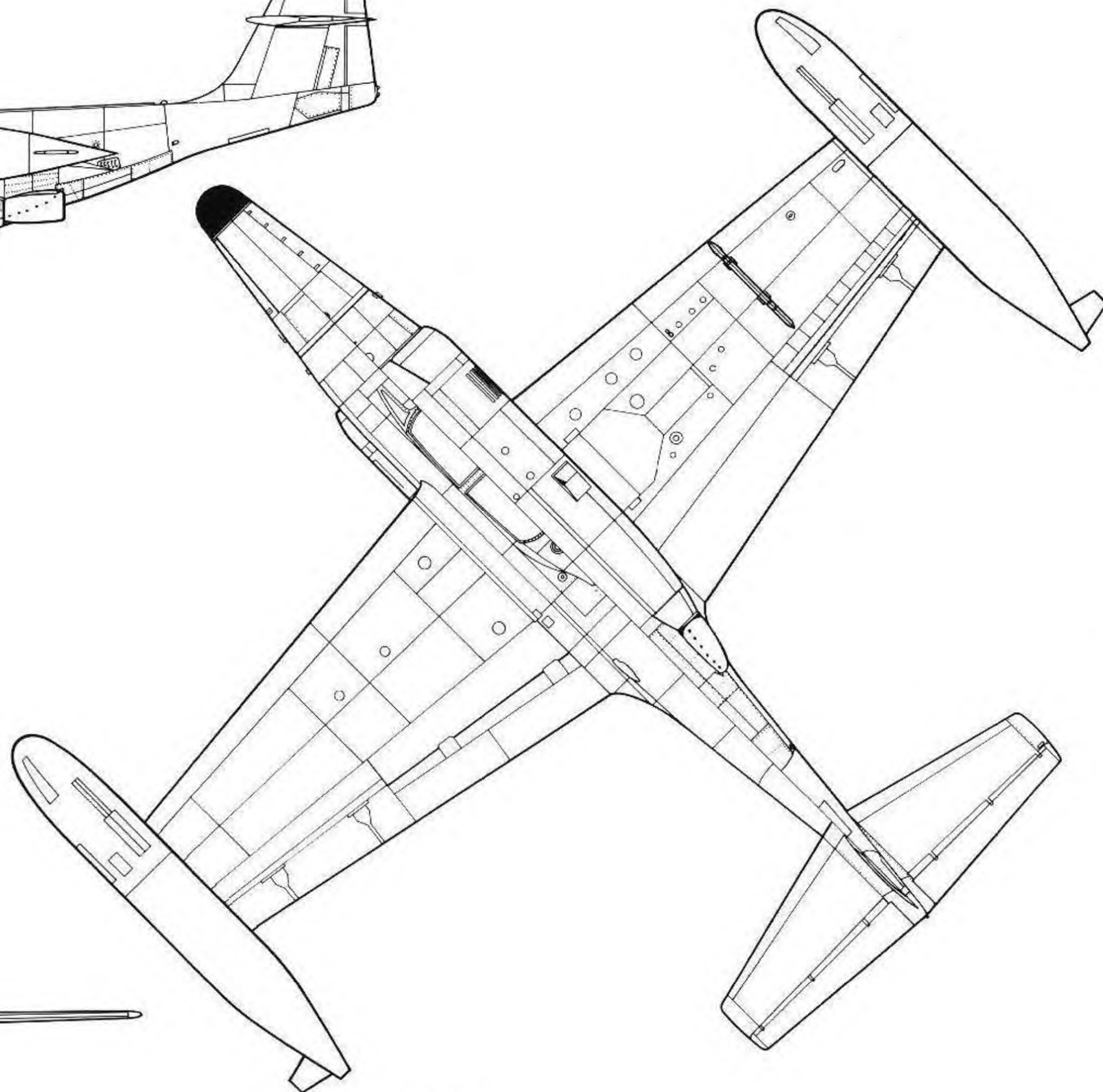
## Specifications

### Northrop F-89H Scorpion

**Wingspan** ..... 59 feet 8 inches  
**Length** ..... 53 feet 10 inches  
**Height** ..... 17 feet 6 inches  
**Empty Weight** ..... 25,194 pounds  
**Maximum Weight** ..... 42,241 pounds  
**Powerplants** ..... Two 7,200 lbst Allison J35-A-35 turbojet engines.

**Armament** ..... Six GAR-1 Falcon air-to-air missiles and forty-two 2.75 inch FFARs.

**Performance**  
**Maximum Speed** ..... 636 mph  
**Service ceiling** ..... 50,000 feet  
**Range** ..... 2,600 miles  
**Crew** ..... Two







The Falcon bays were placed on the top, bottom and outboard side of the weapons/fuel pod with the FFAR tubes mounted in between them. The Falcons were stowed internally in the pods until ready for firing. (Northrop)

MSGT Dick Rosenthal, an armament specialist, loads 2.75 inch Folding Fin Aircraft Rockets (FFARs) into the seven shot rocket compartment of the Falcon/FFAR weapons/fuel pod on an F-89H during 1960.



One of the first squadrons to convert to the F-89H was the 84th Fighter Interceptor Squadron at Hamilton AFB. The 84th FIS was part of the 78th Fighter Interceptor Wing based at Hamilton, which was responsible for the defense of Los Angeles, home of Northrop and other major aircraft manufacturers. (Rowland Gill via Marty Isham)







This F-89H of the 3211th Interceptor Test Group at Eglin AFB during May of 1956 is carrying unusual underwing tanks, which were converted F-80 wingtip fuel tanks modified for use as either target tug reels or air sampling pods. (Bob Dorr)

The 437th Fighter Interceptor Squadron, based at Oxnard AFB, California, converted from F-89Ds to the F-89H during 1957. The tip tanks and underwing tanks are Flat Black and a 437th FIS badge is carried on the tail under the stabilizer. (JEM Aviation Slide)

An F-89H parked in the climatic hanger at Eglin AFB, Florida, at -65 degrees Fahrenheit (similar to an Alaskan winter day). After sixteen hours, the doors were opened and a test crew scrambled the aircraft on a simulated mission. Fog, resulting from the cold air meeting the hot, humid Florida air, was so heavy that the propeller wash from a Beech C-45 was used to keep the entrance clear. (David Menard)







An F-89H of the 76th Fighter Interceptor Squadron at Pinecastle AFB, Florida. The 76th FIS moved from Presque Isle, Maine, to Florida during November of 1957. The stripes on the tip tanks and rudder are Red and White. The angled object under the fuselage is the barrier hook used to engage the crash barrier in an emergency. (Marty Isham)

A pair of 103rd Fighter Interceptor Squadron, 111th Fighter Interceptor Group, Pennsylvania ANG F-89Hs prepare for takeoff from Philadelphia for the flight back to Pittsburgh Airport, their home base. Both aircraft still carry the Arctic Red markings left over from their former active squadron. (Bob Esposito)



The 176th Fighter Interceptor Squadron, Wisconsin ANG transitioned from F-89Ds to the F-89H in July of 1959. The 176th FIS had the second longest time in F-89s and flew every variant of the Scorpion. The unit flew F-89s for twelve years, from 1954 (F-89Bs) to 1966 (F-89Js). Only the Maine ANG flew F-89s for a longer period. (Don Garrett)







This F-89H of the 103rd Fighter Interceptor Squadron, 111th Fighter Interceptor Group, Pennsylvania ANG on the ramp at Pittsburgh during 1960, has a Dark Red radome. The F-89H began to go to the Guard units during 1957, with all F-89Hs being assigned to Guard units by 1959. (Ron Picciani)

An F-89H of the 123rd Fighter Interceptor Squadron, 142nd Fighter Interceptor Group, Oregon ANG based at Portland, Oregon. The 123rd FIS was the first Air National Guard interceptor squadron to transition to the F-89H. (Don Garrett)





# F-89J Scorpion

In sheer numbers, the F-89J was the second most numerous F-89 variant; however, the F-89J was not a new production aircraft. The F-89J was the result of an Air Force program that mated a rebuilt and modified F-89D and the Douglas MB-1 Genie air-to-air rocket, code named *Ding Dong*. The MB-1, later designated AIR-2A, was a nuclear air-to-air unguided ballistic rocket. The weapon weighed 835 pounds, had a range of six miles, and a one and one half kiloton nuclear warhead. The Genie was designed for use against an entire bomber formation, but it could also be launched against a single target.

The F-89J was able to carry two Genies on specially designed rocket launcher rails that were carried on the underwing pylon. Later, the F-89J was further modified with two additional underwing pylons located inboard of the Genie pylons for GAR-2 and later variants of the Falcon air-to-air guided missile.

The F-89J also differed from the F-89D in that the wingtip armament pods were usually replaced with 600 gallon fuel tanks (although several units carried standard F-89D 104 FFAR pods). Internally, the F-89J was updated with the Hughes MG-12 Fire Control System replacing the earlier Hughes E-9 FCS. The new fire control system allowed the pilot to launch the Genie while in a nose high, climbing attitude. This maneuver allowed the pilot to attack bombers that were at a much higher altitude and still get away from the resultant nuclear fireball.

On 19 July 1957, an F-89J (53-2547) of the 84th Fighter Interceptor Squadron at Hamilton AFB, California, made the first live fire of the MB-1 Genie as part of Operation *PLUMB BOB*. The Genie was fired over the Yucca Flats Nuclear Test Site and detonated at 15,000 feet. Test Shot *JOHN* was a complete success, making the Scorpion the first nuclear-armed interceptor in history. As proof that the small yield nuclear device was safe enough to be used over populated areas during an attack on the U.S., the Air Force had several officers stand at Ground Zero, directly under the point of the nuclear detonation. The explosion had absolutely no effect on them — at least at that time.

Initial deliveries of the F-89J began during November of 1956, with the 84th FIS at Hamilton AFB, California, becoming the first operational F-89J unit. On 1 January 1957, the squadron began standing active alerts with aircraft armed with a single Genie rocket. The single rocket armament was done to meet the requirements of the National Security Council even though it was seven months prior to the first Genie live fire test shot at Yucca Flats. Production Genie rockets equipped with Mk 25 Mod 0 warheads began arriving during May of 1957.

There were a total of 350 F-89Ds modified to F-89J standards. All came from block D-35 through D-75 aircraft. The modifications were carried out at the Northrop Palmdale, California, facility between March of 1956 and February of 1958. To arm the F-89Js, approximately 3,150 Douglas Genie rockets and Mk 25 Mod 0 and Mod 1 warheads were built between 1956 and 1963. The F-89J made up the Air Defense Command's nuclear deterrent until the early 1960s when sufficient numbers of the Mach two Genie-armed McDonnell F-101B Voodoo and Convair F-106A Delta Dart became available. During its time in service with the active Air Force, the F-89J was the most heavily armed fighter in the USAF, with two Genies, four Falcons and (when carrying F-89D pods) 104 FFARS. The flyaway cost of the modified F-89J was the same as a production F-89H - \$988,884.00.

The F-89J was phased out of active Air Force service and transferred to Air National Guard units beginning in July of 1959. By 1962, some nine ANG squadrons were equipped with nuclear armed F-89Js. The F-89J remained in service with the 132nd FIS, Maine ANG, and 124th FIS, Iowa ANG until late 1968, when they were finally phased out in favor of supersonic interceptor aircraft.

Over the course of the Scorpion program, Northrop built a total of 1,067 F-89 Scorpions, of which the Air Force accepted 1,052. The program that had begun during 1945 as a propeller driven, all weather replacement for the Army Air Force's night fighter force, ended twenty-three years later with the final phaseout of the world's first nuclear-armed interceptor fighter. By the end of its career, the F-89 had equipped thirty-nine active Air Force units and seventeen Air National Guard squadrons.

**An F-89J of the 54th Fighter Interceptor Squadron based at Ellsworth AFB, South Dakota. Northrop converted a total of 350 F-89Ds (block -35 to block -75) to F-89J standards. The F-89J was the second most numerous variant in the F-89 series. (Bill Curry via Marty Isham)**

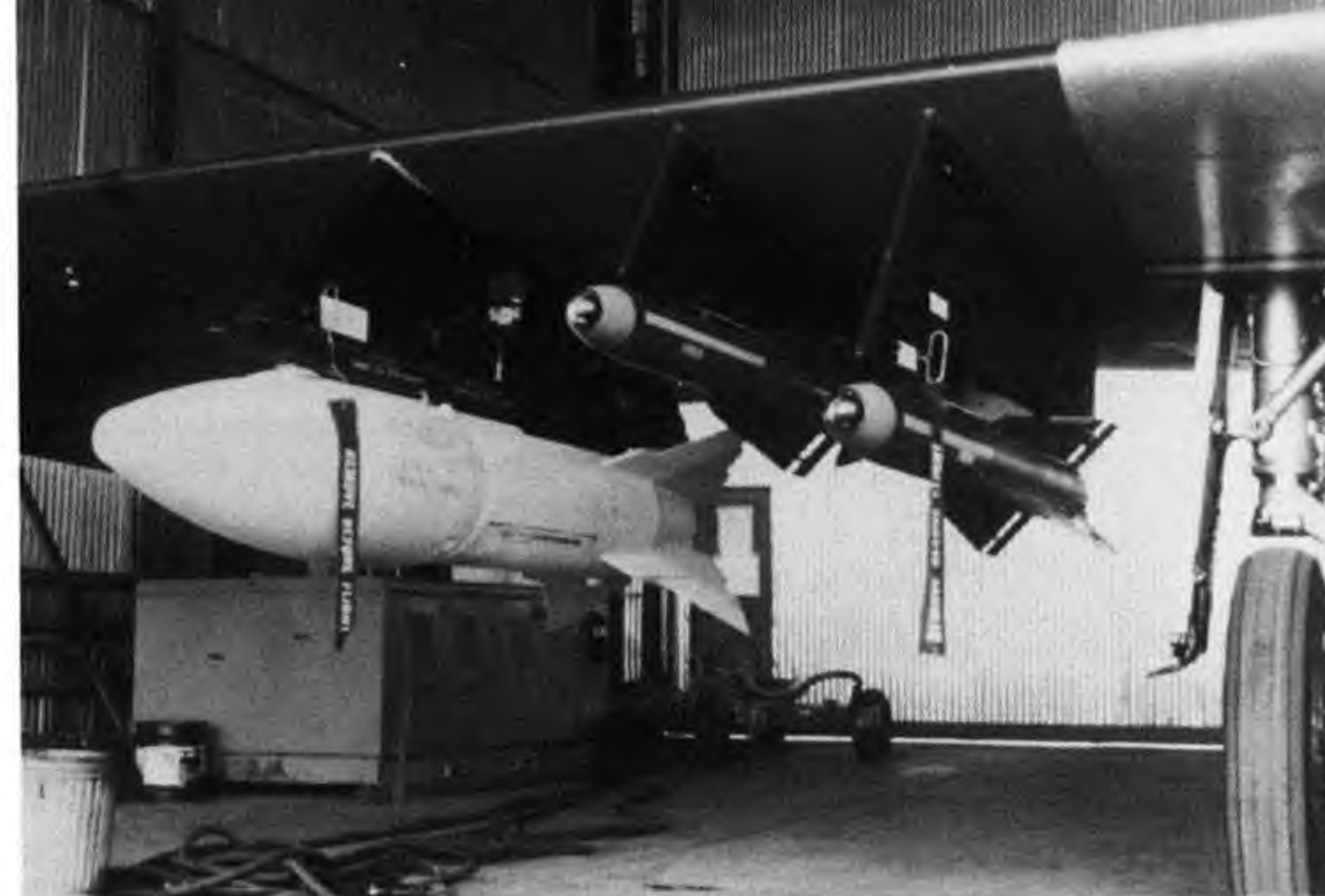






The ultimate F-89 was the F-89J armed with two Douglas MB-1 Genie nuclear-armed air-to-air rockets and four Hughes GAR-2A Falcon missiles. The Genie rocket was armed with a 1.5 kiloton warhead. The fairing under the aircraft's nose was a camera housing. (AFM)

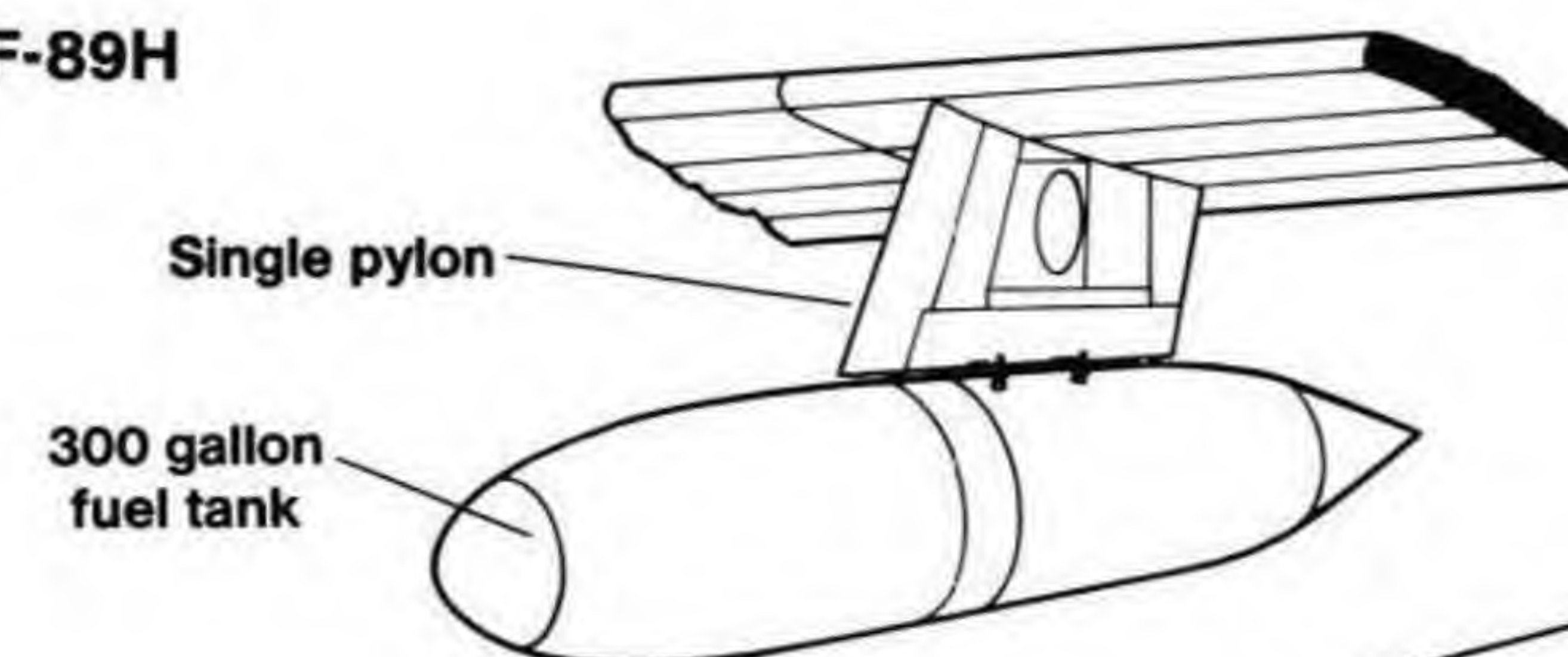
This early F-89J of the 4750th Air Defense Wing at Yuma carries F-89D style fuel/rocket pods on the wingtips and Genie missile pylons under the wings. Very few F-89Js were operational in this configuration; most carried 600 gallon wingtip fuel tanks. (Marty Isham)



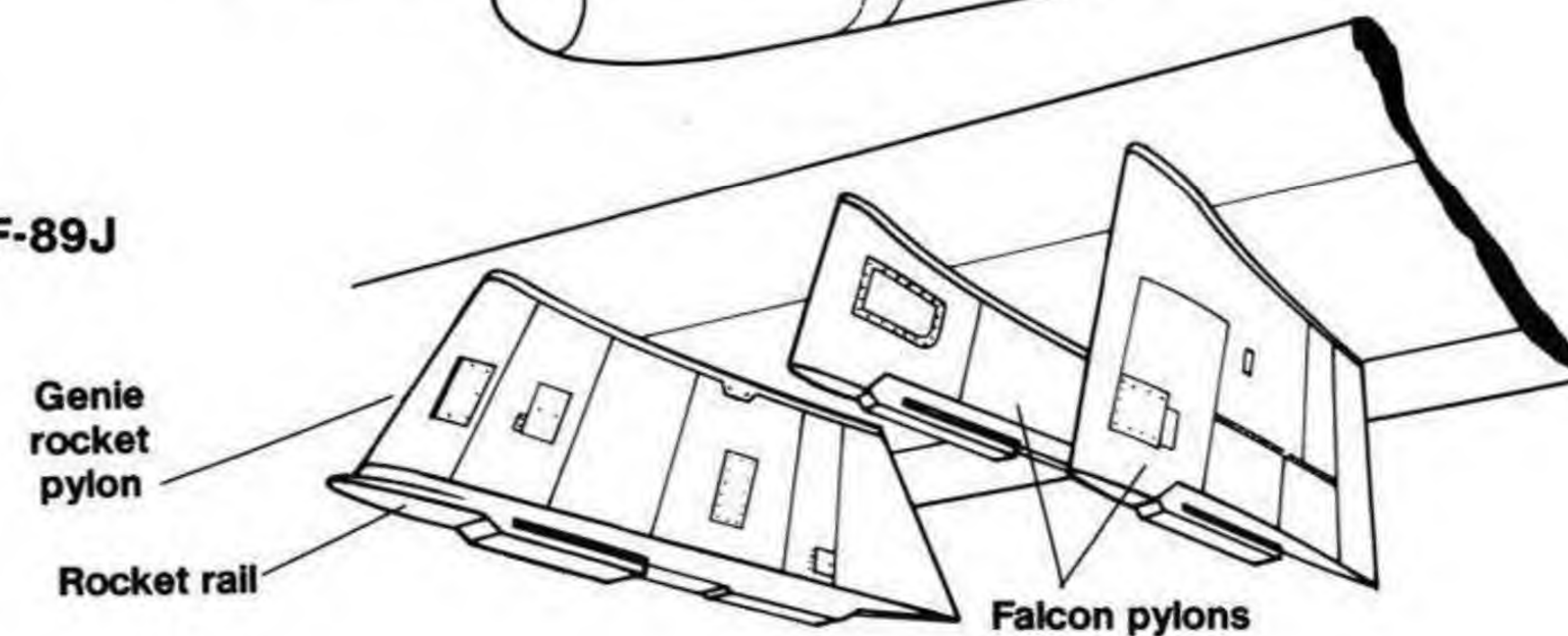
The Genie rocket was carried on a special launch rail attached to the outboard underwing pylon of the F-89J. Falcon missiles were carried on two smaller pylons with differing widths. With the rocket/missile pylons in place, the national insignia and USAF underwing markings were placed over the main landing gear doors. (R.A. Diozzi via David Menard)

## Wing Pylon

### F-89D - F-89H



### F-89J







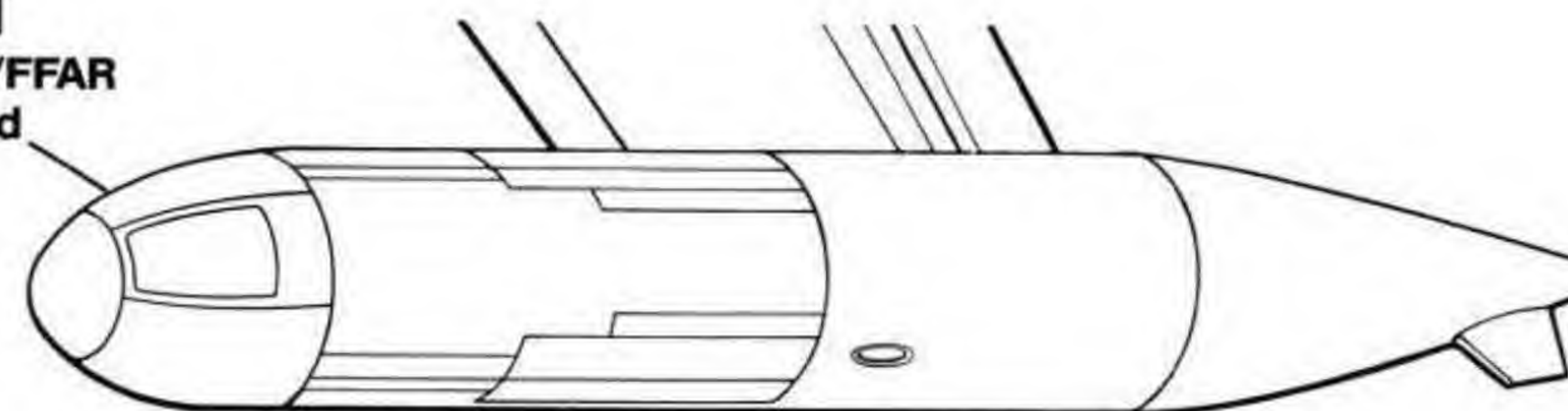
This F-89J of the 58th Fighter Interceptor Squadron at Walker AFB, New Mexico was configured with standard 600 gallon wingtip tanks. These tanks were designed specifically for use on the F-89J. (Ron Picciani via Marty Isham)

A lineup of F-89Js of the 116th FIS, Washington Air National Guard on the ramp at Moses Lake AFB during August of 1954. The overall Air Defense Command Gray (FS16473) Scorpions all carry at least one Genie live-fire symbol on the nose in Red. (Marty Isham)

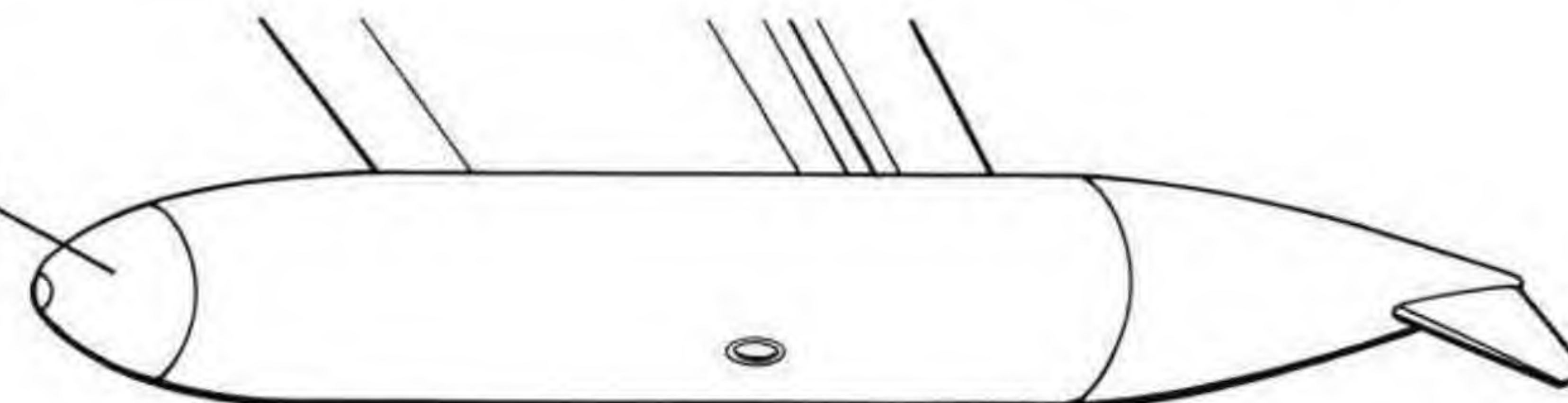


## Wing Tip Pods

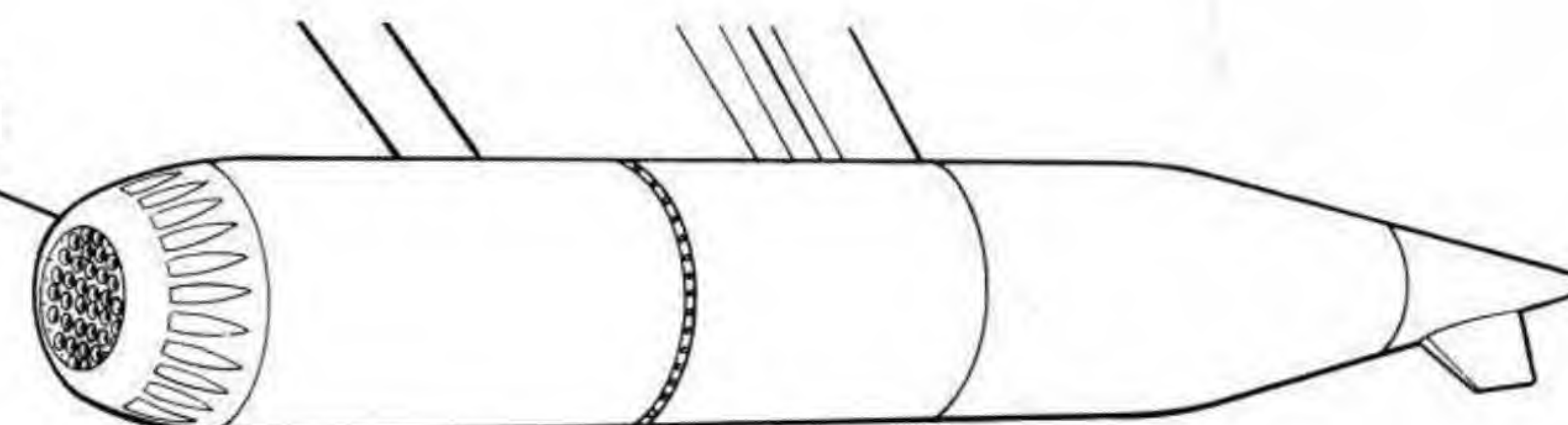
F-89H  
Falcon/FFAR  
pod



F-89J  
(Normal)  
600 Gallon  
fuel tank



(Alternate)  
Rocket/fuel  
pod







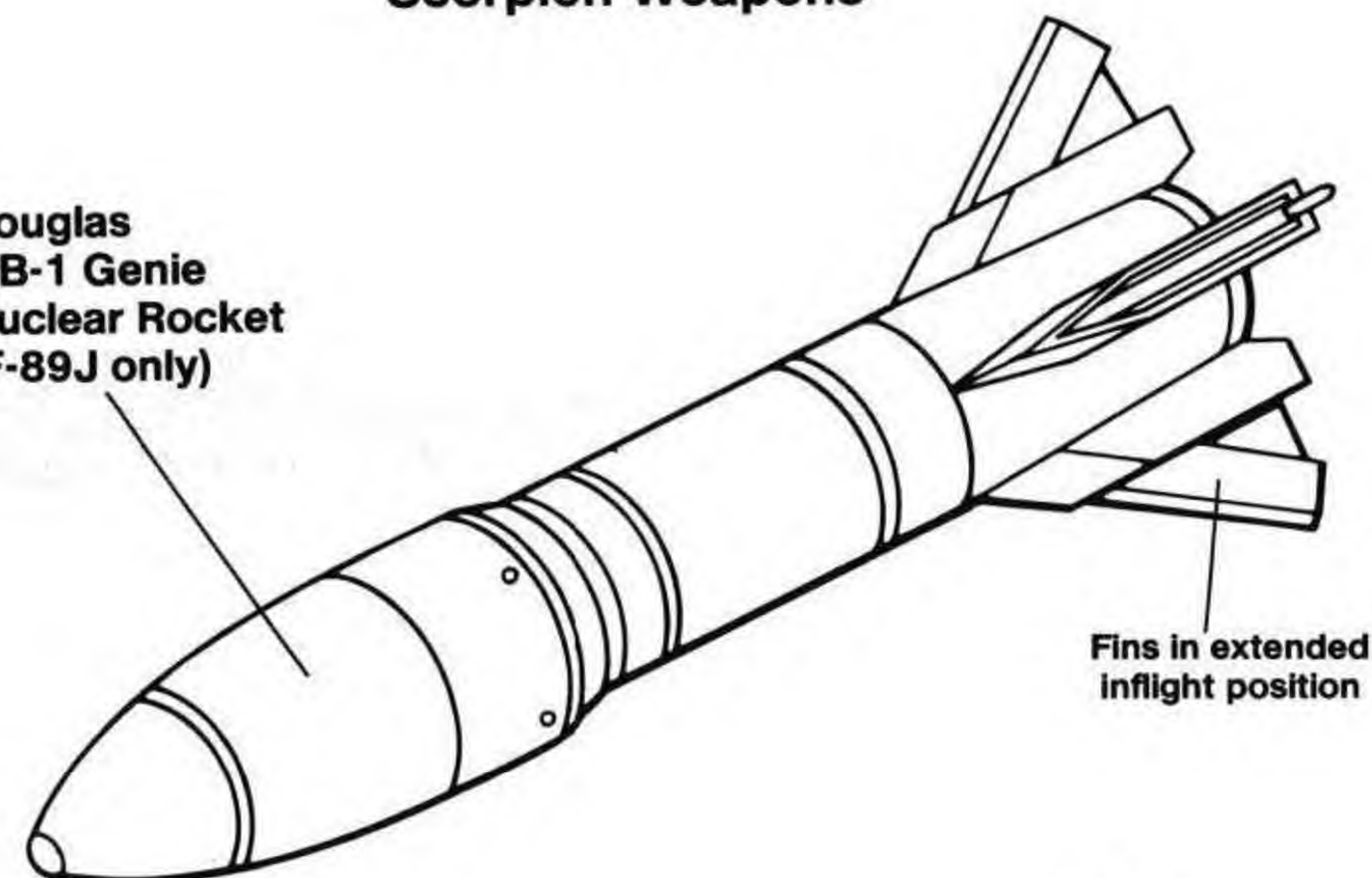
The first squadron to receive the F-89J was the 84th Fighter Interceptor Squadron. The 84th Fighter Interceptor Squadron had the distinction of being the only Air Force squadron to operate every production variant of the F-89. (Doug Olsen via Paul Stevens)

Armament crews at Ladd AFB, Alaska prepare to load a Douglas MB-1 Genie rocket onto the wing pylon of an F-89J of the 449th FIS. This unit retained the FFAR/fuel pods of the F-89D in preference to the standard 600 gallon fuel tanks normally carried by F-89Js. (Northrop)

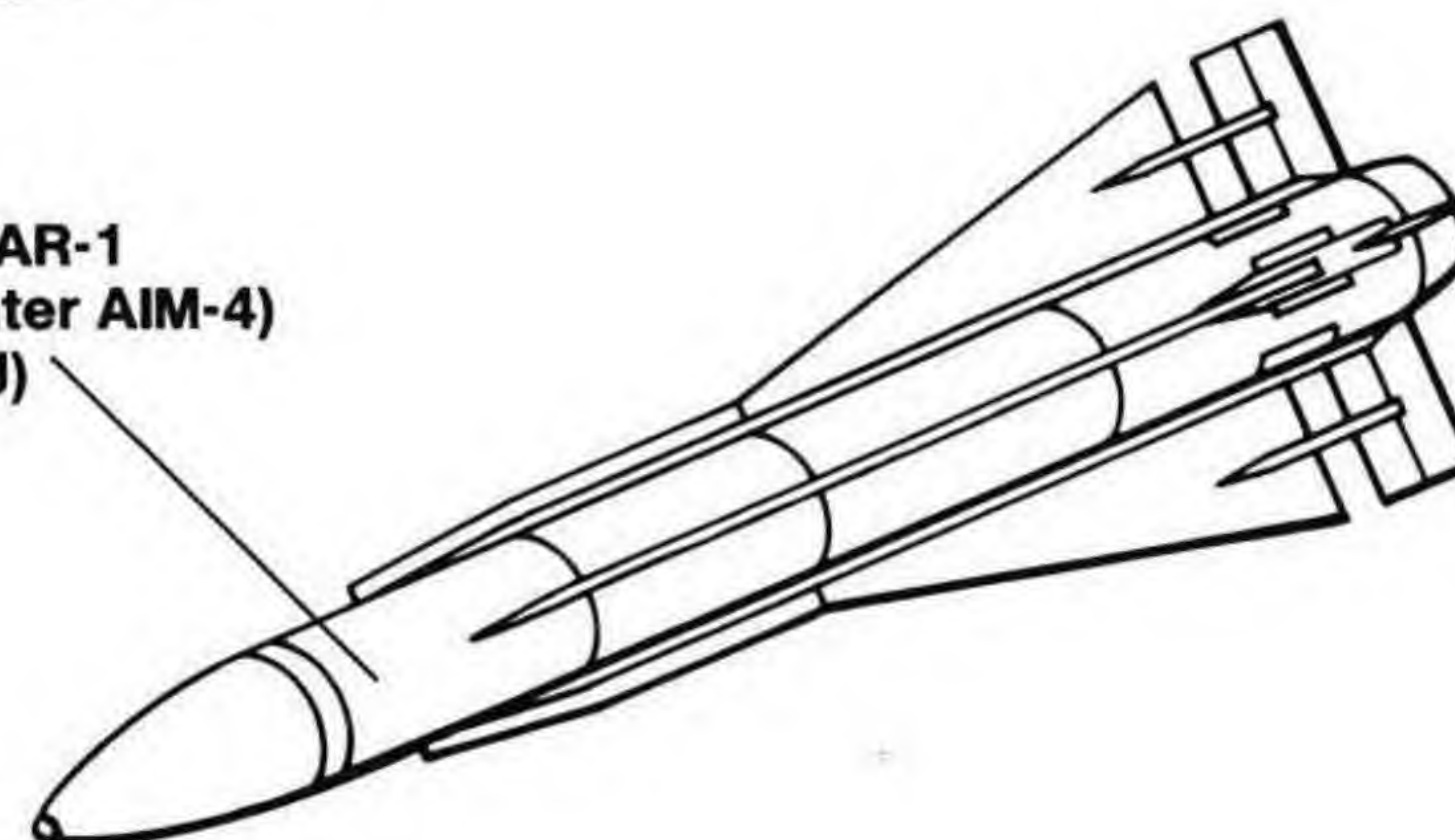


## Scorpion Weapons

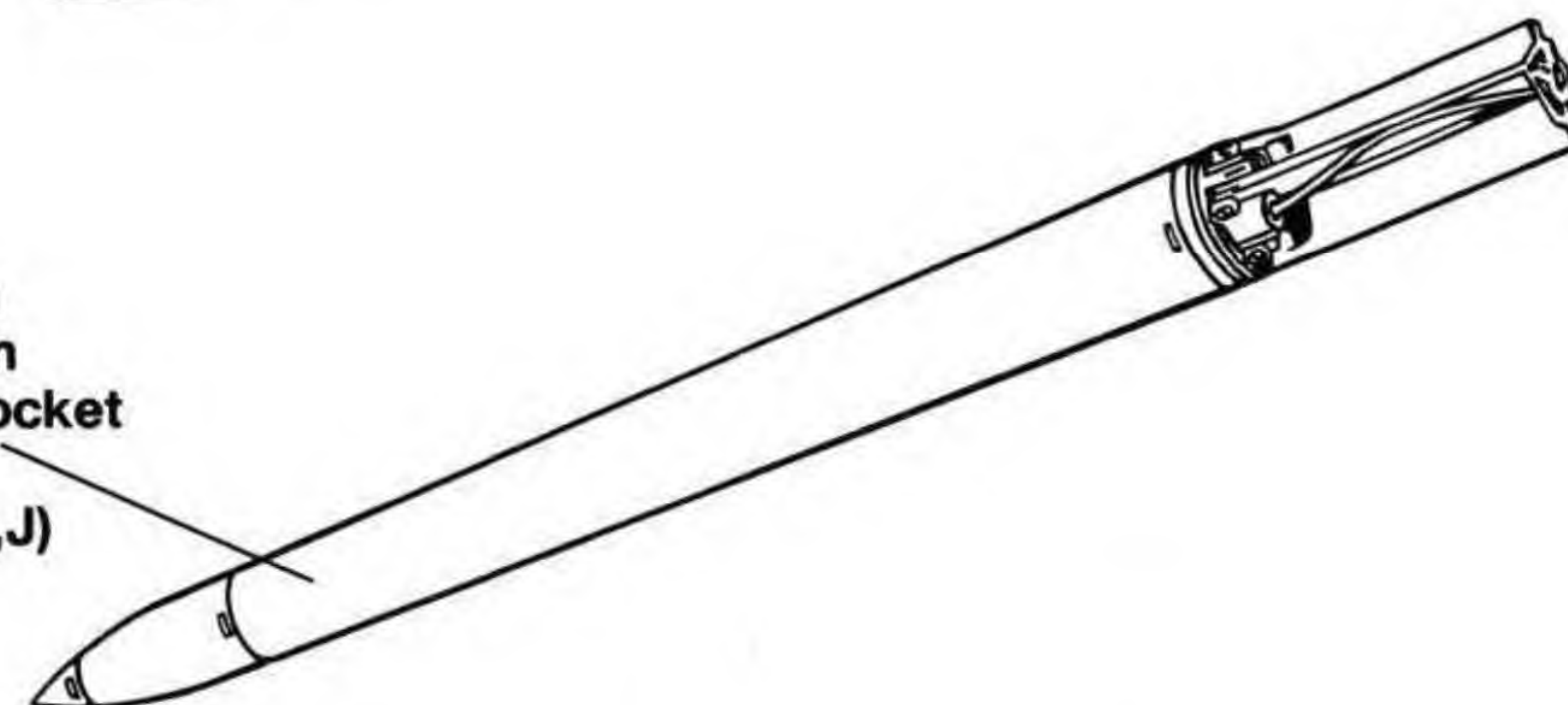
Douglas  
MB-1 Genie  
Nuclear Rocket  
(F-89J only)



Hughes GAR-1  
Falcon (Later AIM-4)  
(F-89H & J)



2.75 Inch  
folding fin  
aircraft rocket  
(FFAR)  
(F-89D,H,J)







An overall natural metal F-89J of the 123rd FIS, Oregon Air National Guard taxis out to the active runway at Portland Airport during May of 1961. There is a Black anti-glare panel on the leading edge of the wing over the Genie pylon. The tip tanks are DayGlo Orange with Green tips. (Ron Picciani)

This F-89J was assigned to the 76th Fighter Interceptor Squadron at Pinecastle AFB, Florida. Rising political tension in the Caribbean area led the Air Force to transfer the 76th from Presque Isle, Maine to Florida during November of 1957. (Frank MacSorley via Marty Isham)

This F-89J of the 15th Fighter Interceptor Squadron was the squadron commander's aircraft. The unit was based at Davis-Monthan AFB, Arizona. The tip tanks, fuselage stripes and rudder are in Orange with a Black outline. The numbers on the tip tank are the last three digits of the aircraft serial and are Black with a White outline. (Marty Isham)







(Above) An F-89J of the 178th Fighter Interceptor Squadron, North Dakota ANG at Hector Field, Fargo, North Dakota. Known as the Happy Hooligans, the 178th FIS converted from F-89Ds to F-89Js in November of 1959. The outer wing panel and outer half of the wingtip tanks are in DayGlo Orange. (Marty Isham)

(Below) An F-89J of the 132nd Fighter Interceptor Squadron, 101st Fighter Interceptor Wing, Maine ANG based at Bangor, Maine. The 132nd Fighter Interceptor Squadron operated the F-89J until July of 1969, when they were finally phased out in favor of Convair F-102As. (Barry Miller)

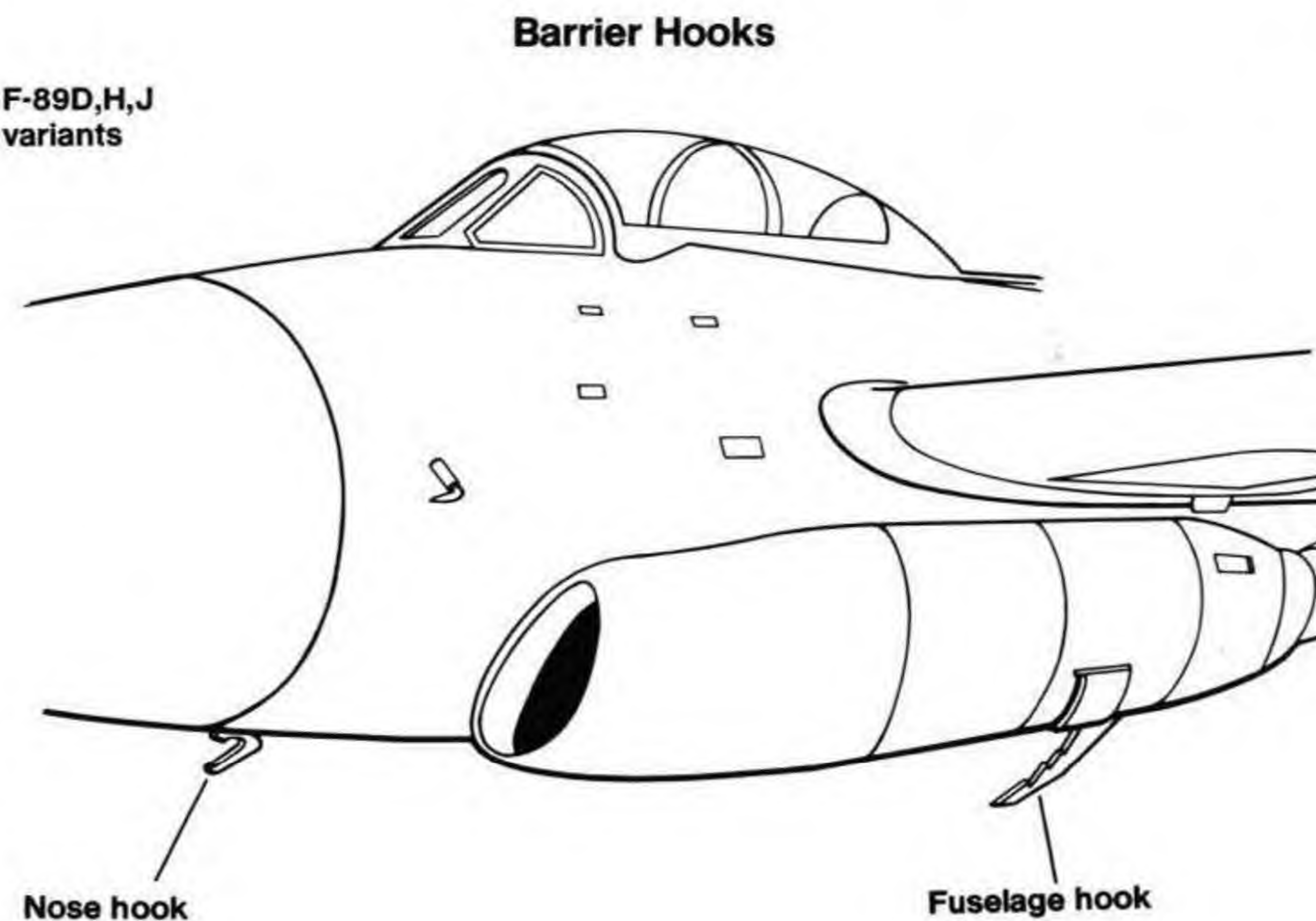






An F-89J of the 134th Fighter Interceptor Squadron, Vermont ANG based at Burlington Airport. The 134th FIS converted to F-89s from Lockheed F-94s during 1958. The squadron flew Scorpions for seven years before converting to the Convair F-102 during 1965. (ANG via Marty Isham)

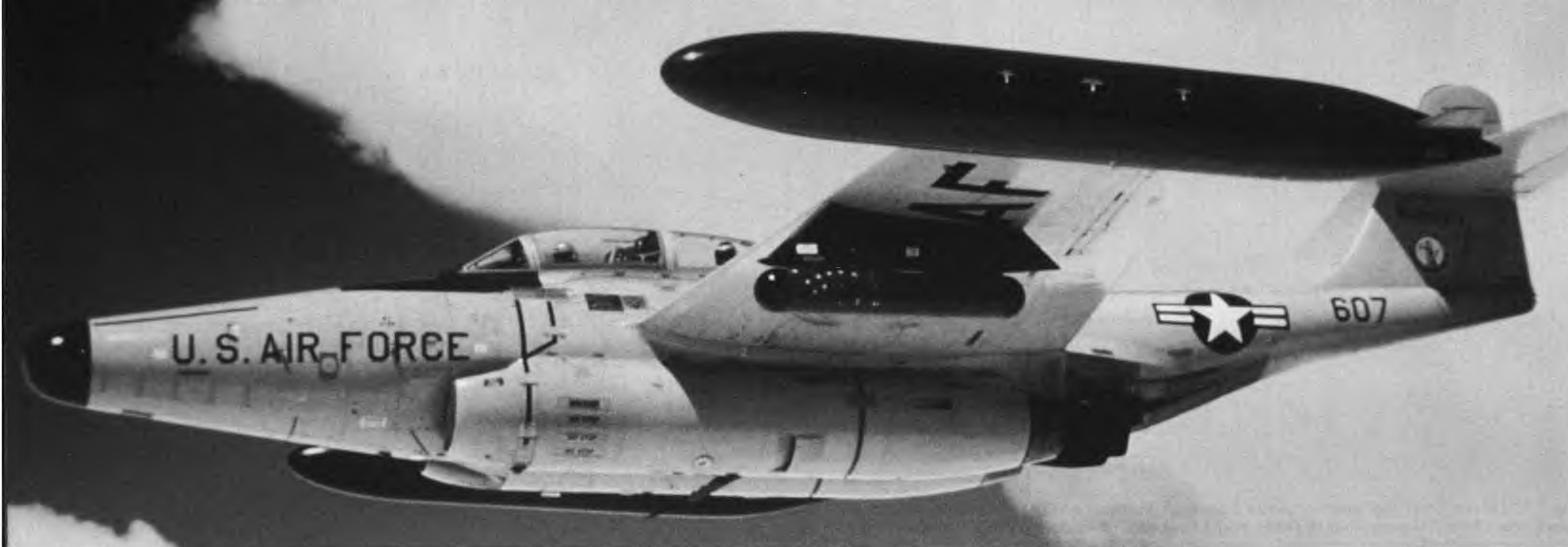
F-89D,H,J  
variants



This F-89J was assigned to the 178th Fighter Interceptor Squadron, 119th Fighter Interceptor Group, North Dakota Air National Guard. There were a total of nine ANG squadrons equipped with the F-89J. (David Menard)







This overall ADC Gray F-89J is assigned to the Minnesota ANG. The extremely clean condition of this aircraft (in spite of the harsh Minnesota winters) is indicative of the pride that Guard crews had in their aircraft. (W. Gatlin via David Menard)

This colorful F-89J was assigned to the 29th FIS at Great Falls AFB, Montana (now Malmstrom AFB). All markings are in Gloss DayGlo Orange and Black. The command band on the fuselage is Red, White and Blue. (Marty Isham)

A ground crewman moves oxygen tanks away from an F-89J Scorpion of the 124th Fighter Interceptor Squadron, Iowa ANG. The 124th FIS finally phased out the Scorpion during 1969. (Don Garrett)







An overall ADC Gray F-89J of the 124th Fighter Interceptor Squadron, Iowa ANG parked on the ramp at Des Moines. The 124th FIS converted from F-86L Sabres to the F-89Js during 1962 and were one of the last units to fly F-89s. (Don Garrett)

Prior to adopting overall ADC Gray (FS 16473) for their F-89Js, the 123rd Fighter Interceptor Squadron, Oregon ANG at Portland Airport, had their aircraft painted in an overall Silver paint to retard corrosion. The Black panel on the leading edge of the wings is an anti-glare panel. The outer halves of the tip tanks are in DayGlo Orange. (Marty Isham)



The passing of the guard. The Convair F-102A replaced the F-89J in most Air National Guard units during the mid to late 1960s. The 176th Fighter Interceptor Squadron, Wisconsin ANG, transitioned to the F-102 during the Spring of 1966. (NGB via Barry Miller)





An F-89B Scorpion of the 190th Fighter Interceptor Squadron, Idaho Air National Guard based at Gowen Field during 1956.



An F-89D of the North East Air Command (NAEC) Rocket Team at the Yuma Gunnery Meet during 1955.

